METROPOLITAN HOUSING MARKET RESTRUCTURING AND IMPLICATIONS FOR POVERTY DECONCENTRATION: THE EFFECTS OF FORECLOSURES ON THE SPATIAL DISTRIBUTION OF HOUSING CHOICE VOUCHER RESIDENCIES

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LIST OF ABBREVIATIONS

ESDA	exploratory spatial data analysis
FCS	foreclosure sales (or sheriff's deeds)
FHA	Federal Housing Administration
FMR	fair market rent (set by U.S. HUD)
FRBNY	Federal Reserve Bank of New York
Gautreaux	Gautreaux Assisted Housing Program
GIS	Geographic Information Systems
HCV	Housing Choice Voucher (Program)
HOPE VI	Housing Opportunities for People Everywhere program
HUD	U.S. Department of Housing and Urban Development
IRR	incident rate ratio
JCHS	Joint Center for Housing Studies of Harvard University
MSA	metropolitan statistical area
MTO	Moving to Opportunity for Fair Housing demonstration program
NBReg	negative binomial regression
NEO CANDO	Northeast Ohio Community and Neighborhood Data for Organizing
NLIHC	National Low Income Housing Coalition
PSH	U.S. HUD's A Picture of Subsidized Households Public Database
PTFA	Protecting Tenants at Foreclosure Act of 2009
REO	real estate owned
Section 8	housing voucher subsidy program (now known as HCV)
SES	socio-economic status
SOI	source-of-income protection policy

SUMMARY

The Housing Choice Voucher (HCV) program is the largest federally subsidized affordable housing program in the U.S., assisting over 2.1 million low-income households to find and obtain decent rental housing units in preferably higher-quality neighborhoods (U.S. HUD, 2014). Through the dispersal of low-income households, one of the program's goals is to deconcentrate poverty and alleviate the standard of living for program participants (Winnick, 1995). Though the program has had some success in achieving this goal, there is continuing evidence that it has yet to realize its full potential, where the distribution of HCV households is quite uneven with several clusters of these households still situated in extreme poverty neighborhoods (McClure et al., 2015).

In light of the recent foreclosure crisis, the impediments of this goal of the HCV program, may have been further exacerbated as a large growing number of HCV tenants have experienced involuntary eviction due to rental property foreclosures. Due to these untimely evictions and limited resources and savings at their disposal, it would appear a daunting task for HCV households to find a suitable relocation home in preferably a neighborhood of similar or better quality. Further adding to their difficulty in obtaining a quality home is that the volume of affordable housing is in continuous decline across the U.S. (JCHS, 2015). However, due to the massive amount of foreclosures and the depressed housing market for homeownership, there is evidence that a plethora of owner-occupied units are being converted into rental housing units in a diverse income range of neighborhoods (Ellen et al., 2013).

In this regard, this dissertation has endeavored to shed light on whether the new rental housing supply created from previously foreclosed properties, has assisted the HCV program's goal of poverty deconcentration. Accordingly, three large central metropolitan counties were analyzed given the following four research questions: (1-2) whether the distribution of HCV residencies more spatially dispersed and less concentrated in high poverty areas after the surge in foreclosures; (3) whether higher levels of foreclosures lead to more HCV residencies in a neighborhood; and (4) whether foreclosures have greater impact on lower socioeconomic status and higher-minority neighborhoods compared to higher socioeconomic status and lower-minority neighborhoods.

Exploratory spatial data analysis and descriptive statistics were used to analyze the first two questions, while multivariate negative binomial regression was used to estimate the latter two questions. The dissertation finds that though HCV households have dispersed widely, the distribution is quite uneven. Also, the share of HCV households residing in high-poverty neighborhoods is shown to have increased over time. Foreclosures appeared to have played a role in this distribution change, as foreclosure are found to have a positive effect on HCV residencies in a neighborhood, though the magnitude of the effect was not found to be substantial. Finally, the impact of foreclosures was found to be greater in lower-income higher-minority neighborhoods compared to higher-income lower-minority neighborhoods. As such, the findings suggest that policymakers need to strengthen protection for renters facing foreclosure, provide better relocation counseling, and increase HCV availability, in order for the HCV program to further achieve its goal of poverty deconcentration.

CHAPTER 1.

RESEARCH INTENT

Over the past few decades, assisted housing programs in the U.S. have markedly taken a shift from supply-side to demand-side policies with a larger focus on tenant-based housing assistance programs compared to place-based housing assistance programs. The dominant tenant-based housing assistance program is the Housing Choice Voucher (HCV) program, which amongst its goals is the spatial deconcentration of inner-city poverty (U.S. Department of Housing and Urban Development, 2001). The idea is to give low-income households greater spatial mobility through housing voucher subsidies, which would enable these households to access a wider range of (private) housing located preferably in neighborhoods with lower poverty rates compared to their previous ones (Winnick, 1995).

Through spatial deconcentration, one of U.S. Department of Housing and Urban Development's (HUD) intentions is to improve neighborhood outcomes for those low-income households participating in the HCV program (U.S. HUD, 2010). This intent is supported by a wealth of past and current studies that argue neighborhood locations and environments shape family and individual outcomes. In the past, several scholars have offered theories for why it is harmful to live in high-poverty neighborhoods, where also residents of these neighborhoods (who are predominantly African-American) lack access to employment and economic opportunities that have gradually moved to the suburbs (Kain, 1968; Wilson, 1987; Jargowsky, 1997; Chapple, 2006).

More recent research has shown additional neighborhood effects other than poverty and economic issues, including exposure to crime, poor quality public and social services, and negative peer influence, that work in tandem to hinder the economic and social mobility of residents in high-poverty neighborhoods (Jencks & Mayer, 1990; Ellen & Turner, 1997; Joseph et al., 2007). As such, the HCV program has been touted as the tool to reduce or eliminate these conditions as it provides HCV recipients a chance to relocate to less poor neighborhoods that accept housing vouchers. However, despite this expectation, the current progress status of the HCV program suggests that the program has not realized its full potential with neighborhood outcomes not having been much improved upon (Cunningham et al., 2010; Goetz & Chapple, 2010; Varady, 2010).

In light of the current and ongoing foreclosure crisis, the impediments of the HCV program's intent to improve neighborhood outcomes through spatial deconcentration may have been further exacerbated as countless HCV tenants are at risk of displacement due to rental property foreclosures. The severity and magnitude of the residency displacement problem faced by tenants (including HCV tenants) due to rental property foreclosures has led to a public law enactment titled the "Protecting Tenants at Foreclosure Act (of 2009)," which offers significant protection to tenants in foreclosed rental properties. Also, within the Act is an entire section specifically addressing Section 8 (i.e., former title of HCV) tenant issues, problems and remedies, which show that the displacement of HCV tenants in foreclosed rental properties is on its own quite substantial.

However, though the Act provides temporary security and protection for tenants (including HCV tenants) in foreclosed rental properties to find a new dwelling within a

reasonable legalized time period (i.e., at least 90 days' written notice), the tenants in most cases are eventually either evicted or move on their own accord (National Housing Law Project, 2010). Hypothetically, this forced (either directly or indirectly) displacement of HCV tenants in foreclosed rental properties should present significant difficulty for the HCV program's intent of improving neighborhood outcomes, as even though a HCV household were able to move to a less-poor neighborhood with higher-quality neighborhood effects, the foreclosure crisis may prevent the household from maintaining occupancy in that neighborhood.

Though HCV tenant displacement due to rental property foreclosures remain evident, the HCV program's intent of improving neighborhood outcomes may be appeased if the displaced HCV household can find affordable rental housing within the same higher-quality neighborhood area or even yet a higher-quality neighborhood than their previous homes. However, when considering the recent rental housing market conditions, the chances of displaced HCV households to find affordable renting units in quality neighborhoods appears rather slim at best.

Several trends suggest such a bleak outlook. It is generally understood that due to the foreclosure crisis numerous former homeowners have become renters, which drives up rental housing demand and reduces rental housing vacancy rates. This increase in rental housing demand has led to a negative impact on rental housing affordability as rental prices have increased and have reduced the availability of affordable housing (Pelletiere, 2009; DiPasquale, 2011; JCHS, 2013). The supply side of affordable rental housing also shows little or no promise for low-income renters. According to Joint Center for Housing Studies of Harvard University (2013), while low-income (earning less

than $15,000) renters have increased by 2.2 million between 2001 and 2010, the number of affordable rental units to these households has declined by 470,000 units over the same period.

As such, considerable negativity surrounds the issue of HCV tenant displacement due to foreclosures and the difficulty of displaced HCV tenants to obtain new rental units in similar quality neighborhoods. However, from a different angle there appears to be a possible positive relationship between the HCV program and foreclosures. According to one news report, it is argued that some HCV households were able to move into previously foreclosed upon rental properties and single-unattached homes in much higher-quality suburban neighborhoods, due to the reason that a continuous stable rent flow that comes directly from the government is a safe method in which to rent out homes and maximize investors' return on investment given the tight housing market (Wotapka, 2010). Though such a report usually lacks sufficient evidence and may not be very generalizable, its financial argument of "stable rent flow" appears to hold some grain of truth.

For example, DiPasquale (2011) argues that housing vouchers spent on rents could possibly ease the cash flow problems that many multi-family rental property owners face. The news report is also somewhat supported by a recent study that shows that roughly half of all HCV recipients reside in suburban areas and that there has been a clear trend of HCV recipients moving further toward higher-income suburbs (Covington et al., 2011). Furthermore, though neighboring homeowners of exclusive neighborhoods may still be opposed to the influx of HCV recipients, there are counter-arguments suggesting that foreclosed vacant properties attract vandalism and loitering (Immergluck

& Smith, 2006; Bess, 2008), which suggests that it may be better off having someone living in a property compared to leaving it vacant.

Given these conflicting arguments, this dissertation endeavors to ascertain the effect of foreclosures on the spatial distribution of HCV residencies. A particular subset question that is also being pursued is whether higher levels of foreclosures result in the deconcentration or concentration of HCV residencies. These set of questions endeavor to answer the issue of whether foreclosures have had a positive or negative effect on poverty deconcentration and the spatial distribution of HCV residencies.

The result should be interesting from a policy perspective, in that if the foreclosure crisis has had a positive effect on poverty deconcentration and lends further support to the trend of HCV recipients moving further towards higher-income suburbs, this would suggest that the HCV program is fulfilling its intent and may warrant an increase in housing voucher availability. However, if the foreclosure crisis has had a negative effect on poverty deconcentration, where HCV recipients are reconcentrating in low-income neighborhoods, it would lend further evidence to the argument that housing vouchers alone cannot remedy the intents of the HCV program and improving the neighborhood outcomes of HCV households. If this is the case, the policy recommendation would be one made by many HCV scholars where place-based public services and social assistance should be provided to HCV households, in addition to the voucher subsidy.

In chapter 2, a literature review is conducted to understand the major areas and focus of HCV research in the past. The primary gap in the research that I intend to contribute to is that almost all HCV research has focused on the voluntary act of

residential mobility, whereas I endeavor to research the effects of involuntary (or forced) moves of low-income HCV recipient households. Given that the foreclosure variable forms a large part of this dissertation, a literature review on the spatial distribution of foreclosures is also presented. Chapter 3 presents a causal theoretical model linking foreclosures to HCV residencies. Research questions and hypotheses are also presented in this chapter.

Chapter 4 presents the research design and methodology to analyze the four hypotheses summarized in chapter 3. Descriptive statistics and exploratory spatial analysis techniques are applied to analyze the first two hypotheses, while negative binomial regression is used to analyze the latter two hypotheses. The chapter also presents the study areas of three large U.S. counties with large cities within each of the counties' borders. Chapter 5 presents research findings. Finally, chapter 6 concludes with a summary discussion and a narrative on policy implications based on results produced from this dissertation.

CHAPTER 2.

LITERATURE REVIEW

2.1. HCV Program – Intellectual History

2.1.1. Theses of the HCV Program

Before reviewing the past and current body of Housing Choice Voucher (HCV) research, it is important to first present the primary theses that the HCV program was built upon, as most succeeding HCV research has been conducted to investigate the theories these theses put forth. In 1967, during the height of urban riots produced by the Civil Rights movement, President Lyndon B. Johnson established the National Advisory Commission on Civil Disorders (also known as the Kerner Commission) to investigate the cause of these riots. The commission reported that the primary cause for the riots was a result of African-American frustration over the lack of economic and job opportunities where they predominantly resided, the inner-city. Subsequently, scholars and professionals have published related articles regarding the causes and effects of poverty concentration in inner-cities and proposed that deconcentrating poverty should be the policy of choice to eradicate poverty issues. Among these theories, three seminal theses have managed to gain the largest audiences.

One of the first theses to emerge was the spatial mismatch hypothesis by John Kain. He asserts that inner-city residents (who are considered predominantly African-American) have poor employment and economic opportunities, due to the fact that African-Americans have been confined to inner-cities through residential racial

segregation, while jobs and employment opportunities have decentralized into the suburbs (Kain, 1968). Based on this argument, Kain (1992) states that African-Americans should be given the opportunity to move to residential suburbs in order to obtain and maintain stable jobs.

Another theory that became popular was the culture of poverty thesis, which was originally formulated by Oscar Lewis, but revised to fit the context of U.S. inner-cities by Daniel Patrick Moynihan in his 1965 government report. Moynihan (1965) argues that families and family structures of predominantly African-American inner-city residents are deteriorating and are on the verge of collapse. He argues that African-American inner-city residents are entangled in a web of pathology, which included joblessness, delinquency, school failure, crime, fatherlessness, and out-of-wedlock births that characterized underclass behavior (Monyihan, 1965). Therefore the rationale is to break-up this concentrated culture of poverty and social stigma through both affirmative action policies and poverty deconcentration efforts.

Later scholars have modified the definition of underclass and one ultimately goes on to present a new thesis that refutes the patronizing culture of poverty thesis. While Monyihan labels all inner-city poor populations as the underclass, it is now believed that there are two groups of inner-city poverty classes, the underclass and the working poor (Newman, 1999). In contrast with the original definition of underclass, the working poor are those that have jobs (albeit low-paying jobs) and have values that correlate with the conservative middle-class in that they feel obligated to work and pull their economic weight within their households (Wilson, 1987; Newman, 1999). Therefore it is to be

understood that the culture of poverty may exist, but is not a description that can be generalized to reflect all inner-city low-income residents.

In 1987, William Julius Wilson presented his rationale of urban poverty in The Truly Disadvantaged. He argues that there is a weak labor force attachment among relatively young urban minority populations which was caused primarily by historical racial discrimination and in part by migration of Black populations to large northern cities in search of jobs during the same time when industries were abandoning cities for the suburbs and other countries in the 1960s (Wilson, 1987). He further argues that the dwindling presence of middle-class families in inner-cities due to out-migration to suburbs has removed economic opportunities and social buffers that once deflected the impacts of joblessness in inner-city neighborhoods (Wilson, 1991). In a similar vein, Jargowsky (1997) has argued that structural changes in the economy has magnified the poverty issues of inner-city neighborhoods, where demand for low-skilled labor has declined in the inner-city to disproportionately affect inner-city minority residents who are disadvantaged due to the poor quality of education options and systems.

The three reviewed theses each point towards a particular policy goal of which has been the research intent of most of the succeeding HCV research. Research on HCV spatial deconcentration stems primarily from Kain's spatial mismatch thesis, and HCV research on poverty deconcentration stems from Moynihan's culture of poverty thesis. The more recent research on the neighborhood quality of deconcentrated HCV households primarily stems from Wilson's urban poverty rationale.

2.1.2. Pilot Programs Initiated Utilizing Housing Choice Vouchers

Another area that must be reviewed are the pilot programs initiated by the federal government to expand the HCV program, as most qualitative and case study research conducted on the HCV program have relied primarily on the data that have resulted from these pilot programs. Three main policy initiatives were undertaken by the federal government to extend HCV opportunities to distressed inner-city residents with the purpose of dispersing and relocating them into middle-class White-majority suburban neighborhoods or relatively well integrated neighborhoods within the inner-city. These are the Gautreaux Assisted Housing Program (Gautreaux); the Moving To Opportunity (MTO) demonstration program; and Housing Opportunities for People Everywhere program (HOPE VI).

2.1.2.1. Review of the Pilot Programs & HOPE VI

The Gautreaux program grew out of a series of class-action lawsuits filed in 1966 against the Chicago Housing Authority and HUD alleging that housing authorities deliberately segregated African-American households through redlining practices, such as site and tenant selection policies. One part of the settlement was the Gautreaux program, where selected households would be given Section 8 housing vouchers and rent subsidies to relocate in predominantly White middle-class suburban neighborhoods. The primary rationales were that this would eliminate the spatial mismatch of African-Americans seeking employment, while children would receive a better education, and the relative stable middle-class neighborhood would provide aesthetic qualities, such as a sense of calm and safe environment (Keels et al., 2005). The program began in 1976 and

ended in 1998 after relocating 7,100 families, of which the majority moved to affluent White-majority suburban neighborhoods.

Based on the outcomes of the relatively small-scale Gautreaux program, HUD launched the MTO demonstration program, in order to evaluate whether assisted housing mobility programs could succeed on a national level (Comey et al., 2008). Launched in 1994, the MTO program was set to be implemented in five large cities selected by then-HUD Secretary Henry Cisneros: Baltimore, Boston, Chicago, Los Angeles, and New York. Eligible participants were limited to very low-income families with children that either lived in Section 8 project-based housing or public housing in inner-city neighborhoods with high-poverty concentrations. High-poverty concentration areas were considered to be areas where over 40 percent of the population was below a poverty threshold that was determined by the United States Census Bureau.

Once eligible participants were accepted, they were randomly assigned to three groups: the experimental group; the Section 8 comparison group; and the control group. The experimental group received Section 8 housing vouchers which they could only use in low-poverty area census tracts with less than 10 percent of the population living below the poverty threshold. Along with the vouchers, participants received counseling, assistance, and information in finding a private housing unit to lease and relocate and settle in the new environment. The Section 8 comparison group received geographically unrestricted housing vouchers and also received the customary assistance provided by the local public housing authority. The control group continued to receive their project-based assistance or stayed put in public housing.

The Gautreaux program and the MTO program may appear to be near identical programs. However there are two primary differences. The MTO program was a much larger scale initiative that also employed a monitoring system to evaluate outcomes of participating households. Also, while the Gautreaux program defined its eligible participants based on ethnicity, the MTO program defined receiving neighborhoods based on their degree of poverty (Goetz, 2003). This can be seen as an ideological transfer by federal and local governments from implementing race-specific policies to race-neutral ones. However, despite the framing of the policy as a race-neutral initiative, most eligible participant families were predominantly African-American households, which still fostered racial tension among the White-majority middle-class suburban neighborhoods (Goetz, 2003).

The HOPE VI program emerged from a study of dilapidated public housing structures by the U.S. Congress appointed National Commission of Severely Distressed Public Housing in 1989. The central driving theme was to revitalize decaying public housing projects by demolishing current structure and redeveloping the area with mixed-income housing projects, where some units would remain public housing units, while other units were subject to the open housing market. The program was also authorized to provide public housing residents with Section 8 housing vouchers with which they may relocate to a less-poor neighborhood or eventually return to their original neighborhood once the mixed-income housing project was completed. A concerning issue with HOPE VI is that the program is based on involuntary dispersal of distressed residents residing in dilapidated public housing projects (Turner, 2007).

2.2. HCV Research Review

In general, HCV research can be bracketed into two major research areas, where one area endeavors to address whether the HCV program has realized its intent of deconcentrating poverty through the spatial distribution of HCV households across neighborhoods. Research in this area endeavors to identify if the housing policy has been effective in realizing its policy goals usually through large spatial scale longitudinal analysis. The other area primarily focuses on the quality of the neighborhoods that HCV households have relocated into, and endeavors to address whether if the new neighborhood that these households have relocated to have lower-poverty levels and better quality neighborhoods than their previous place of residence before receiving the housing voucher.

The primary focus of the first research area of neighborhood distribution is to ascertain whether the HCV program has realized its goal of poverty deconcentration through the application of housing voucher subsidies. The research intent is to find if HCV households have been able to access a wide range of neighborhoods across metropolitan areas using the housing voucher. Research in the latter area tends to be either quantitative or case study driven, where the two underlying themes are whether HCV recipient households have improved their socioeconomic status after relocation into higher-quality neighborhoods, and the difficulties faced by these households in making relocation decisions during the housing search process.

With regard to neighborhood quality outcomes research, two types of research appear prevalent. One type usually involves large spatial scale longitudinal analysis to find whether relocated HCV households live in lower-poverty and higher-quality

neighborhoods. Earlier research in this area focused on the poverty rate as the single measure of neighborhood quality, while more recent research has expanded to the use of other causal variables (e.g., income, crime, school quality, etc.). The other type of neighborhood quality outcomes research tends to be more case-study driven, where the socioeconomic status of relocated HCV households and the housing search difficulties faced by HCV households are studied. Much of the research in this area uses relatively small sample data from the pilot programs (i.e., Gautreaux and Moving To Opportunity (MTO) demonstration programs) or the Housing Opportunities for People Everywhere program (HOPE VI).

2.2.1. Spatial Distribution of HCV Residencies

Studies addressing HCV residency neighborhood distribution find that though voucher holders live in most neighborhoods, they are not evenly distributed across neighborhoods and consistently face discrimination and exclusionary practices which hinder their access to all available rental properties, that accept HCVs (Devine et al., 2003; Kingsley et al., 2003; Cunningham & Droesch, 2005). Though distribution may be uneven across neighborhoods, studies of HCV residencies on a national scale argue that the program appears to have achieved its goal of poverty deconcentration (Devine et al., 2003; Patterson et al., 2004; Mills et al., 2006). Covington et al. (2011) supports this argument by showing that HCV residencies are increasingly found in suburban areas.

Other studies argue that compared to project-based affordable housing programs, the HCV program has been more successful with poverty deconcentration and minority desegregation (Hartung & Henig, 1997; Newman & Schnare, 1997; Deng, 2007), with

the exception of the Low-Income Housing Tax Credit (LIHTC) program which has been argued to more effectively deconcentrate low-income households into lower-poverty areas (McClure, 2008). However, McClure (2008) does acknowledge that the two programs serve different income-level populations, where the typical HCV household earns less than the federal poverty line, while LIHTC households have income levels at 30 to 50 percent of area median income.

Though HCV households may have successfully spread across metropolitan areas, Hartung & Henig (1997) caution that though the HCV program has led to poverty dispersals beyond central-city boundaries, poverty may become re-concentrated in suburban neighborhoods with lower socioeconomic status and high minority concentrations. This indeed is found to be the case by several more recent studies which show that despite a wider distribution range of HCV residencies across neighborhoods, there exists considerable spatial clusters of HCV residencies in both the inner-city and suburbs (Wang & Varady, 2005; Wang, Varady & Wang, 2008; Oakley & Burchfield, 2009; Wyly & DeFilippis, 2010), where the clusters depend on several factors, including poverty (Wyly & DeFilippis, 2010) and race (Oakley & Burchfield, 2009).

2.2.2. Neighborhood Quality Outcomes of HCV Residencies

2.2.2.1. Large Spatial Scale Longitudinal Analysis Research

With regard to neighborhood quality of HCV residencies, prior research has shown that most HCV residents still live in relatively high-poverty low-quality neighborhoods (Pendall, 2000; Devine et al., 2003; Varady & Walker, 2003; Shih et al.,

2009). There are several key neighborhood and residential characteristics that lead them to this finding.

Though research has shown that not many HCV households are situated in neighborhoods with extremely high poverty rates (i.e., 40 percent rate) (Devine et al., 2003), it should be noted that the national poverty rate has declined over the past decade before the current ongoing recession, and that there is still a large segment of low-income HCV households that reside in relatively lower-income neighborhoods compared to the overall population (Covington et al., 2011). In other words, though the absolute level of poverty rates of neighborhoods with HCV residencies has declined, these same neighborhoods are still much poorer than a neighborhood with the average nationwide poverty rate. This is evidenced by Devine et al. (2003), where they find that HCV households residing in neighborhoods with (or above) 40 percent poverty rates have declined, but that most households still reside in neighborhoods with 20 to 30 percent poverty rates.

Studies examining crime and public safety levels of HCV residencies find that crime levels are significantly correlated with the location and concentration of HCV residencies. However, the causal direction points more to the fact that HCV recipients move into high-crime neighborhoods due to their limited affordable housing options (Briggs & Dreier, 2008; Van Zandt & Mhatre, 2009; Ellen et al., 2011), rather than to the supposition that HCV households bring or attract crime into neighborhoods where they relocate (Rosin, 2008). One study further supports the HCV to high-crime neighborhood causal direction based on a study of neighborhood satisfaction among HCV recipients and unassisted renters. The study finds that neighborhood satisfaction is lower for HCV

recipients compared to unassisted renters, where community services, perceptions of safety, and crime levels serve as primary factors that lead to overall neighborhood satisfaction (Ross, 2011).

Studies examining market condition characteristics of HCV residencies find that neighborhoods with tight housing markets usually have low numbers of HCV residencies while the inverse is true for neighborhoods with weak housing markets (Pendall, 2000; Finkel & Buron, 2001). A weak housing market usually has higher vacancy rates and lower rent levels, which allows for more favorable housing search options for HCV recipients (Pendall, 2000; Finkel & Buron, 2001). Related to studies of market conditions of HCV residencies is the willingness of landlords and owners of rental properties to accept housing vouchers. In order to participate in the HCV program, landlords and owners must fill out considerable paperwork, while rental properties must meet certain HUD quality standards which are consistently monitored over time.

Considering the tedious and stringent requirements of the HCV program many landlords and owners are unwilling to participate in the program, particularly more so for those who have rental properties in tight housing markets (Pendall, 2000). However, conversely, in a weak housing market, it appears that landlords and owners of rental properties have a higher propensity to participate in the program despite the numerous hassles (Finkel & Buron, 2001).

Finally, many studies have found that there is a clear relationship between voucher location and the availability of affordable housing in a neighborhood (Turner, 1998; Pendall, 2000; Turner, Popkin & Cunningham, 2000; Devine et al., 2003). In particular, HCV concentrations have been shown to be significantly correlated with

affordable housing availability (Wang, Varady & Wang, 2008). This relation may be quite obvious given that the term 'affordable housing' usually refers to housing with rents at or below the Fair Market Rent (as defined by HUD), which places less burden on HCV recipients to pay rents (after HCV subsidy reduction). Therefore more affordable housing availability in a neighborhood should attract more budget-conscious HCV recipients.

2.2.2.2. Case-Study Driven Research of the Socioeconomic Status of HCV Households

Most in-depth HCV research on households has utilized resulting data from the federally initiated pilot programs, where the research is usually a mix of quantitative and qualitative research methods. By conducting regression analysis to find whether the current residence of Gautreaux program participants were better or worse off with regard to socio-economic status (SES) and crime rates compared to their origin-neighborhood and placement neighborhood, Keels et al. (2005) find that on average participants have maintained residency in higher SES and lower crime neighborhoods compared to their origin-neighborhood. However, it should be noted that the authors find that only 19 percent have managed to maintain residency in their placement middle-class suburban neighborhood. Keels et al. (2005) maintain that when low-income poor households of distressed and segregated inner-city neighborhoods are given the opportunity to voluntarily relocate to less-poor neighborhoods through the use of housing vouchers, they will most likely continue to maintain residence in a neighborhood with higher SES status and lower-crime rates than their origin-neighborhoods.

Results from MTO are also mixed, where only about a third of the experimental group movers and about a quarter of the Section 8 comparison group movers in a Three-City (greater Boston, New York and Los Angeles) ethnographic study consistently maintained residency in low-poverty neighborhoods (Comey et al., 2008). The primary reasons for families that could not maintain residency in low-poverty neighborhoods were "problems with their lease, conflicts with the landlord, wanting bigger quality apartments, safety issues, and building issues (Comey et al., 2008)." For those that were able to maintain residency in low-poverty neighborhoods, they appeared to have been luckier with regard to the above issues and also had less family attachments and obligations in their origin-neighborhoods (Comey et al., 2008).

A collective interpretation of the aforementioned research findings suggests that demand-side policies (or more specifically Section 8 or HCV program) have only successfully relocated a small portion of subsidy recipients into lower-poverty neighborhoods. While Keels et al. (2005) argues that voucher subsidy recipients on average as a whole have relocated to lower-poverty neighborhoods, evidence by Comey et al. (2008) and Goetz (2005) suggest that while the current residence of voucher subsidy recipients may be less-poor neighborhoods compared to their original ones, they may either still be very poor neighborhoods when compared to the metropolitan average or may be neighborhoods showing worsening neighborhood trajectories. These suggestions appear to gain more truth through Oakley & Burchfield's (2009) Chicago area study where they find that spatially clustered voucher housing units are predominantly located in distressed high-poverty neighborhoods.

2.2.2.3. Housing Search Difficulties Faced by HCV Households

Though housing market characteristics of HCV residencies have been researched through longitudinal studies, much of the literature on housing search difficulties faced by HCV households are based on data collected from HOPE VI or the pilot programs (primarily MTO). Studies examining individual (or household) preferences of HCV recipients find that many voucher holders make short distance moves due to preferences of maintaining family, friendship, and social networks (Varady et al., 2001; McClure, 2004; Cunningham & Droesch, 2005; Chapple, 2006). In a similar vein, a HOPE VI research by Kleit & Manzo (2006) find that if a voucher recipient household has initial preferences of relocating it will do so, however other factors such as family size and age of heads of households may hamper with the relocation desire of HCV households. Also, some studies have found that since HCV recipients are largely dependent on public transportation, they prefer not to move into suburban neighborhoods that lack public transit systems (Popkin & Cunningham, 2000; Varady et al., 2001).

Studies examining racial discrimination factors faced by HCV recipients find that many neighborhoods exhibit (illegal) exclusionary practices based on race with landlords and owners unwilling to rent out to racial minority HCV recipients and households (Pendall, 2000; Popkin & Cunningham, 2000; Deng, 2007). Possibly due to these discriminatory and exclusionary practices, though, most African-Americans prefer racially mixed neighborhoods. They also prefer to move into all-black neighborhoods compared to a predominantly white neighborhood (Farley, Fielding & Krysan, 1997; South & Crowder, 1998). In a different vein, one study shows that Asians and Hispanics prefer to voluntarily cluster spatially based on ethnicity (Alba, Logan & Stults, 2000).

2.3. Foreclosure Outcome Research

2.3.1. High Foreclosure Area Neighborhood Distribution & Quality Outcomes

The literature on neighborhood outcomes due to foreclosures is quite substantial with a particular focus on the neighborhood characteristics of high foreclosure areas. Coincidentally, but not unexpectedly, studies on the spatial distribution of foreclosures find that though there exists several clusters of critically high foreclosure areas, areas with elevated levels of foreclosures are found throughout all neighborhoods in both the inner-city and suburbs (Duda & Apgar, 2005; Garcia, 2003; Delgadillo & Erickson, 2006; Schintler et al., 2009; Li, 2011). Garcia (2003) provides a finer detail of the spatial distribution and concentration of foreclosures, where he argues that concentrations of foreclosures are gradually spreading outwards from the inner-city towards suburban areas in the form of a spatial ring around the inner-city.

Areas with high concentrations of foreclosures are found to be in neighborhoods that are usually low-income, have minority-majority populations, and have older housing stock (Baxter & Lauria, 2000; Duda & Apgar, 2005; Pedersen & Delgadillo, 2007; Immergluck, 2008; Gilderbloom et al., 2011). In particular, Duda & Apgar (2005) show that critically high foreclosure areas (proxied as census tracts) have the largest shares of the aforementioned characteristics compared to relatively lower foreclosure areas. The authors use quartile categorization of foreclosure filing rates to determine levels of foreclosure and find that the highest quartile have predominantly minority-majority populations with over 80% being African American, compared to the lowest quartile which have less than 10% African American residents. Some studies also show that high

foreclosure rates are significantly correlated to high incidences of violent crime (Immergluck & Smith, 2006; Gilderbloom et al., 2011).

2.3.2. Real Estate Investors' Role in the Foreclosure Crisis

Though areas with high concentrations of foreclosures are shown to have similar socioeconomic characteristics of neighborhoods with high concentrations of HCV households, the foreclosure literature reviewed above mainly consider only single-family owner-occupied properties and do not take into account rental properties. This particular issue needs to be addressed since HCV households are, in fact, all housing renters. Pelletiere (2009) has estimated that roughly 40 percent of the households affected by foreclosures are renters. This argument was made based on the fact that an estimated 20 percent of all foreclosures are rental properties and that most rental properties are multi-unit properties comprising of two or more renting households (Pelletiere, 2009). However, the dearth of available data that distinguishes between renter- and owner-occupied foreclosed properties continues to make it difficult to understand the socioeconomic impact of foreclosures on housing renters and their spatial distribution (Manglik, 2012).

Among the scant research that relates foreclosures to rental properties, Haughwout et al. (2011) find that real-estate investors have played a major role in purchasing large volumes of residential properties in low- and moderate-income neighborhoods during the period before the foreclosure crisis, and subsequently also were significant drivers in the acceleration of foreclosures during and after the housing bust. The authors define "investors" as multi-property owners who are typified in two

categories: investors who want to rent the property or keep the property as a vacation home (buy and hold), or investors who wish to resell a purchased property immediately (buy and flip) (Haughwout et al., 2011).

Using the Federal Reserve Bank of New York's Consumer Credit Panel data, the authors find that investors had a higher propensity to default on their mortgages when the carrying cost of a property (e.g., principal, interest, taxes, insurance, maintenance fees, etc.) exceeded income returns, thereby proving that investors operated purely based on "investment motives" and not "consumption motives," as nearly all investors were not occupants of their properties (Haughwout et al., 2011). While it is not clear whether the investors defined above are the same, Immergluck & Law (2014) state that investors have been keen on purchasing large shares of properties in distressed low-income and urban neighborhoods. They provide evidence that there has been an increasingly large build-up of investor-owned properties in low-income and minority-majority neighborhoods (Immergluck & Law, 2014). These studies lend support to the argument that among the foreclosed properties in high foreclosure areas, a large share were, indeed, rental properties.

2.4. Effects of Foreclosures on HCV Unit Availability

Though the discussion of prior HCV and foreclosure outcome research show that there are several common variables of HCV and foreclosure concentrated areas, the linkage between the two are still unclear. Thus, the next step would be to analyze the possible causal effects of foreclosures on HCV unit availability. In this regard, it is important to understand the supply-side and demand-side effects of foreclosures (and if

possible the interaction between the two effects) and how they may result in the increase (or decrease) of available affordable housing supply that rent to households with the housing voucher subsidy. As such, Figure 1 presents a theoretical model of the effects of foreclosures on HCV availability. Each theoretical pathway is discussed in further detail in the following.

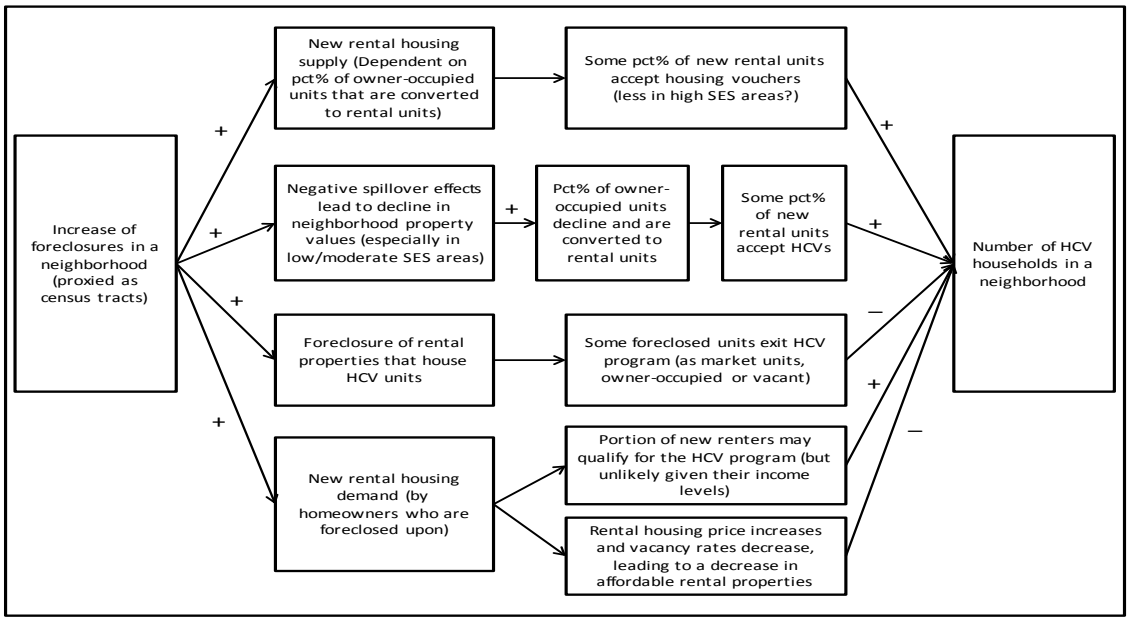

Figure 1. Theoretical Effects of Foreclosures on HCV Availability

From the supply-side perspective, there is clear evidence that owner-occupied properties that have been foreclosed upon are increasingly being converted into rental properties, where the intent of the investor is to buy and rent, and then sell later when the housing market rebounds (Immergluck & Law, 2014). This phenomenon is further evidenced by the fact that housing inventory absorption by potential homebuyers will be insufficient "due to low house prices, tight underwriting guidelines and elevated levels of unemployment (Mistretta & Chambers, 2013). Also, it has been argued that some of

these newly converted rental properties will be made available to HCV households, as a stable rent flow that comes directly from the government should appeal to some of the investors of these rental properties (Wotapka, 2010; DiPasquale, 2011).

Upon further review of the supply-side effects of foreclosures, it appears properties that have been foreclosed upon can lead to a trigger effect (or "contagion effect"), where properties around the foreclosed property will also move into foreclosure, which signals that there may be an increasingly abundant supply of foreclosed properties that may be converted into future rental properties. When house prices fall, the propensity for homeowners to default on their mortgages rises as they fall into a negative equity position (e.g., owing the mortgage lender more than the property value). The propensity to default may increase with additional shocks such as income loss, which has been a major issue during the current recession.

Given such ramifications, properties with such characteristics that have been foreclosed upon are shown to sell at a discount (i.e., less than present house price), as such foreclosed properties are, on average, of lower quality and are less likely to be properly maintained by the previous distressed homeowners (Frame, 2010). This in turn leads to negative spillover effects (or a contagion effect) induced by the foreclosed property as nearby property sales prices fall though this effect dissipates the further away a property is from the foreclosed property (Frame, 2010). However, it should be noted that in areas of concentrated foreclosures, these spillover effects may expand to affect a wider area range (Towe & Lawley, 2013). One reason behind this effect may be that a large number of neighboring foreclosures may signal that a neighborhood is in decline,

which could propel incumbent homeowners to flee the neighborhood and potential new homebuyers to shun the same neighborhood (Towe & Lawley, 2013).

In this regard, then one might argue that owner-occupancy housing within high foreclosure areas should decline due to such negative contagion effects, and give rise to foreclosed properties being converted into rental properties. As argued earlier, then some portion of these newly converted rental properties may accept HCV households, which may be more pronounced given the ramifications of negative spillover effects. It should also be noted that some portion of rental property foreclosures that housed HCV units may continue to accept housing vouchers even after the transfer of ownership.

From a demand-side perspective, it is quite evident that there will be a large increase in rental housing demand, as previous homeowners require a new residence. This particular effect should have both positive and negative impacts on the availability of future HCV units. The positive impact depends upon the fact that previous homeowners are still of higher-income levels than the average HCV household. Using the FRBNY/Equifax Consumer Credit Panel data, Molloy & Shan (2011) find that though foreclosures raise the probability of moving and convert previous homeowners into renters, the majority of these households are able to find residency within a similar (or slightly less) quality neighborhood. Furthermore, though even lower-income previous homeowners may qualify for the housing voucher, the immediate impact should not be felt, as there are currently long waiting lists for potential housing voucher recipients due to the increasingly limited federal funds for the HCV program.

On the flip side, the increase in rental housing demand should lead to a negative impact on rental housing affordability as rental housing prices increase and housing

vacancy rates decrease, where such mechanisms lead to a reduction in the amount of available affordable housing (Pelletiere, 2009; JCHS, 2013). Though it is not directly related to foreclosures, it should be noted that the amount of available affordable rental units has steadily declined, where the supply gap between low-income renters and affordable units has increased two-folds over the past decade (JCHS, 2013).

2.5. Limitations of Previous HCV Research

This dissertation is primarily concerned with the spatial distribution of HCV residencies and whether the distribution is affected by foreclosures. Prior HCV research on the effects of the resulting spatial distribution of HCV residencies have predominantly focused on household preferences and choice, given that the HCV subsidy was created to give low-income households the voluntary option of upward residential mobility. As reviewed above, three areas of HCV research are prevalent regarding these effects to spatial distribution.

1. The effect of individual and household preferences and choice (to move) on the spatial distribution of voucher holders.
2. The effect of discrimination (largely racial, but some income-related) on limiting household preferences to move.
3. Housing-market characteristics (e.g., amount of affordable housing, vacancy rates) that limit household preferences to move.

In any case, all three areas are essentially analyzing the effects of personal choice and the barriers that limit personal choice, and in the big picture only regard the spatial distribution of HCV households as a voluntary act of residential mobility.

However, what if the move is involuntary, where it is not a personal (or household) choice of residential relocation but a forced residential displacement? Though prior research has shown that the spatial distribution of HCV residencies is (unevenly) widespread and deconcentrated from the inner-city, the question arises of whether the recent foreclosure crisis further fueled these trends or reversed these effects. As such, at this time, there appears to be very limited empirical research on the effects of forced displacement on the spatial distribution of HCV residencies.

It must be stated, that there has been some research on the involuntary displacement of HCV households through the HOPE VI program. For example, Goetz (2002) conducted an inconclusive study of involuntary HOPE VI families and voluntary HCV recipients in Minneapolis/Saint Paul, in order to find whether there was a difference in the neighborhood outcomes between the two types of relocation groups. However, the study does not analyze the resulting spatial distribution of HCV residencies.

Furthermore, involuntary displacement due to foreclosures is very different from displacement through government intervention (i.e., HOPE VI). Involuntarily relocated households through the HOPE VI program are previous inhabitants of inner-city public housing units and are given ample time (or warning) to search for relocation homes using the HCV subsidy with the option of professional housing search assistance. On the other hand, involuntarily displaced households due to foreclosures are highly likely to be HCV households that had already voluntarily moved to their current residence, and are given

only 90 days' written notice to move out. These HCV households are also most likely to receive no housing search assistance.

Even going to the larger topics of these two variables (i.e., rental property foreclosures result in the eviction of tenants, while voucher holders are a subset of housing renters in general, therefore the larger topic would be "the effect of evictions on renters' spatial distribution"), there appears to be limited research available at this time,[1] though it should be noted that there has been substantial research on the relationship of high foreclosure areas and low-income households as addressed above.[2] Though there is some literature on the supply-side and demand-side effects of foreclosures, even within this literature, the distinction between owner-occupied and rental foreclosures is unclear, making it difficult to quantify the impact of foreclosures on housing renters, much less so for HCV households. As such, there are several areas of HCV and foreclosure research which appear to relate to the topic of this dissertation; however almost no research appears to address the effect of foreclosures on the spatial distribution of HCV residencies.

[1] One such research is by Comey & Grosz (2011), where they find that children of evicted owner or renter households (which may possibly include HCV households) who relocate due to foreclosures are largely re-situated into high-poverty high-crime neighborhoods.

[2] Research in this area may relate to the effects of foreclosures on the spatial distribution of HCV residencies, since most HCV households are in fact low-income households.

CHAPTER 3.

CAUSAL MODEL, RESEARCH QUESTIONS AND HYPOTHESES

3.1. Immediate Effects of Foreclosures on HCV Spatial Distribution

This dissertation endeavors to bridge the phenomenon of spatially concentrated foreclosures and the spatial distribution of HCV residencies to ascertain whether the spatial distribution of HCV residencies is affected by foreclosures. Since the primary goal of the HCV program is to spatially deconcentrate poverty through the utilization of the HCV subsidy, this dissertation further endeavors to ascertain whether higher levels of foreclosures result in the deconcentration or concentration of HCV residencies.

A theoretical model of the effects of foreclosures on HCV availability was presented in the previous chapter with a discussion of the possible foreclosure supply-side and demand-side effects that should in tandem determine the count of HCV residencies in a neighborhood. As this dissertation does not specifically intend to distinguish each theoretical pathway and test each possible theoretical effect (primarily due to data limitations), a simplified causal model is presented in Figure 2.

Figure 2. Causal Model of Foreclosures and HCV Availability

Given these research questions and the causal model presented in Figure 2, the following hypotheses are proposed to be tested to find whether the spatial distribution of HCV residencies is affected by foreclosures. The expectation is that the supply-side effects of foreclosures will dominate and therefore as a result increase the amount of HCV unit availability.

- Hypothesis 1: Overall, on net, the distribution of HCV residencies after the foreclosure crisis was more spatially distributed than prior to the surge in foreclosures.
- Hypothesis 2: Overall, on net, the distribution of HCV residencies after the foreclosure crisis was less concentrated in high poverty (i.e., poverty rates of over 40 percent) tracts.
- Hypothesis 3: Higher levels of foreclosures in a census tract increase the number of HCV units in the same neighborhood.

3.2. Lasting Effects of Foreclosures on HCV Spatial Distribution

An additional fourth hypothesis is proposed to be tested in order to find whether the socio-economic status and racial composition of a neighborhood lead to different levels of rental housing availability resulting from foreclosures. The hypothesis has been designed not only to examine the likely residential differences between levels of income and race, but also to assist in addressing how the spatial distribution of HCVs may further change once we move beyond the current foreclosure crisis and economic recession. The

future outlook is particularly important in that the current crisis and recession are seen as singular events that may not recur in any short period of time.[3] Therefore, there needs to be some further analysis on whether the effects that are found from the preceding hypotheses will continue to persist for a considerable period of time into the future.

- Hypothesis 4: Foreclosures in high socioeconomic status and low-minority neighborhoods result in fewer HCV units than foreclosures in lower socioeconomic status and high-minority neighborhoods.

A recent stream of foreclosure studies have shown that investors exhibit a high-likelihood to purchase low-value foreclosed REO properties in low-income minority neighborhoods with higher foreclosure rates (Immergluck, 2012; Ellen et al., 2013; Pfeiffer & Molina, 2013; Immergluck & Law, 2014). From the rental housing perspective, under typical circumstances (i.e., without the foreclosure crisis), it is quite obvious that lower-income neighborhoods usually have more renters than higher-income neighborhoods, and past HCV research has shown that HCV rental units are more readily available and exist overwhelmingly in these lower-income neighborhoods (Ellen et al., 2007; Oakley & Burchfield, 2009). Given such evidence then one might conclude that lower-income neighborhoods should have a disproportionately large amount of new rental and HCV units due to foreclosures, compared to higher-income neighborhoods.

[3] This does not imply that the current foreclosure crisis and economic recession are over or nearing its end. Though over four million homeowners were foreclosed upon between 2008 and 2011, as of 2012 an additional two million homeowners are estimated to be at least 90 days behind on their mortgage payments (JCHS, 2013).

However, though this may be true for the opposite ends of the income (and/or race) spectrum of neighborhoods, the disparity between moderate-income and lower-income neighborhoods is not so obvious.

Given the historic economic downturn of the foreclosure crisis, there have been major shifts in the U.S. housing market. The current homeownership rate is estimated to be 65.2 percent, which indicates an 18-year low and is four percentage points below the all-time high of 69.2 percent at the height of the housing bubble in 2005 (U.S. Census Bureau, 2014). On the other hand, rental housing demand continues to increase and as a result rental vacancy rates are steadily declining (JCHS, 2013; U.S. Census Bureau, 2014). These shifts along with other issues such as stagnated home prices and limited mortgage credit available to potential homebuyers have led financial analysts to state that the U.S. is increasingly moving towards a "rentership society" (Chang et al., 2011).

Upon further review, it appears apparent that this notion of a "rentership society" does not solely pertain to only lower-income neighborhoods where REO investor activity is massively intense due to the high volume of foreclosures. In a foreclosure study of Atlanta, Miami and New York City, Ellen et al. (2013) find that REO investor activity is quite substantial in moderate- and middle-income neighborhoods as well, though it is most intense in the lowest-income neighborhoods. Some of the substantial REO investor activity in moderate- and middle-income neighborhoods may be explained by the emergence of single-family rentals as a possible institutional asset class.

Due to the large volume of foreclosed REO properties and the strong rental housing market, private equity firms, mortgage real estate investment trusts (REITs) and even homebuilders have acquired large REO portfolios with the intent to rent (or lease) to

consumers, and then sell well ahead into the future when housing prices rebound and appreciate (Rahmani et al., 2012). There is also evidence that these investors are not only purchasing REO properties to rent, but also building new single-family homes with the intent to rent (or lease) and not sell immediately (Dewan, 2013). However, it should be noted, given that this asset class is still in the early stages of its development, there is controversy surrounding whether this asset class truly signifies a structural shift of the U.S. housing market.

Two primary trends lend support to the argument that the institutional asset class of single-family rentals is indeed a structural housing market shift that may well persist. One trend is the concerns that Americans have about homeownership as potential homebuyers are increasingly wary of purchasing a home, given falling home prices and the current economic climate (Chang et al., 2011). Based on a question within Fannie Mae's National Housing Survey that asked mortgage holders whether housing is viewed as a safe investment, Belsky (2013) finds that the share of mortgage holders who replied it was a safe investment fell between 2003 and 2012, with a ten percentage drop of 82 to 72 percent between 2010 and 2012. Though the evidence shows that homeownership is still dominantly preferred, there also appears to be a psychological shift where it has become more acceptable for Americans to rent as opposed to own, given their experiences with the foreclosure crisis.

Another trend may be more directly related to the institutional asset class of single-family rentals argument. Given the current economic recession, the pool of potential first-time homebuyers has dramatically decreased, particularly among young adults in the age group of 25 to 34 years old. Due to high levels of unemployment and

limited wages, many young adults are often forced to share an apartment with friends or live with their parents (Dewan, 2013). Even those young adults that are capable of being potential homebuyers increasingly tend to rent for now and temporarily (or permanently) shelf the notion of home buying and leave it for later in hopes that the housing market rebounds (JCHS, 2013). The connection to the institutional asset class argument is that potential first-time homebuyers predominantly search for housing in moderate- and middle-income neighborhoods, however given the reasons state above, a majority of the available homes in these neighborhoods are now being purchased by large REO investors as the pool of first-time buyers has shrunk.

Given the preceding discussion, the emergence of single-family rentals as an institutional asset class should result in more new available rental units in moderate- and middle-income neighborhoods, though somewhat lesser than the amount of units available in lower-income neighborhoods. However, it is also uncertain whether HCV households will be able to take advantage of this housing market shift and expand their presence into moderate- and middle-income neighborhoods as the precipitous rise in rental housing prices may limit their access to available single-family rentals in these neighborhoods.

CHAPTER 4.

RESEARCH DESIGN AND METHODOLOGY

In order to test the hypotheses presented in chapter 3, I examine three large central metropolitan counties in three different states in the U.S., each of which houses a large city and is located within a large metropolitan area, to find the effects of foreclosures on the spatial distribution of HCV residencies. In order to understand the effects of foreclosures on HCV residencies in more depth, variables that have been found to have a relationship with both foreclosures and HCV residencies will be incorporated into the research models.

4.1. Analysis Background and Data Sources

4.1.1. Study Areas & Analysis Duration

To begin the process of study area selection, I looked at the top fifty metropolitan statistical areas (MSAs) in the U.S., in terms of population size. Since, census tract-level HCV data were easily retrievable from U.S. HUD's A Picture of Subsidized Households online public database, I set forth to find corresponding tract-level foreclosure data. Through a preliminary search for foreclosure data within these MSAs, I found that though MSA and county total figures were readily available, smaller unit area (e.g., census tract or parcel) data were extremely difficult to obtain. Also, even within a particular MSA, each county within the MSA were found to collect and manage their

jurisdiction's foreclosure data separately, without a central MSA (or larger geographical unit) depository. As a result, this led me to reduce the geographical size of my study area to either the county or city level.

Since, one of my primary research objectives was to study the spatial dispersal record of HCV households, I settled on analyzing large metropolitan counties which completely encompassed large central cities. This enabled me to conduct a central city versus suburban area comparison study.

Once the study area geographical unit was determined, I conducted a foreclosure data search through three avenues: government, academia, and private. Private companies (e.g., RealtyTrac) that appeared to collect, store and disseminate foreclosure data were instantly found to be an impossible avenue to obtain data due to the exorbitant data prices. After an extensive search through government and academia channels, I was able to obtain census tract-level foreclosure data for the following three counties:

- Cook County (including the city of Chicago), Illinois
- Cuyahoga County (including the city of Cleveland), Ohio
- Mecklenburg County (including the city of Charlotte), North Carolina

Though the selection of study counties may have been arbitrary in terms of data availability, the three counties appear to have relatively different socio-economic and housing characteristics. As seen in Table 1, total population in Cook County has been quite stagnant from 2000 to 2014, while Cuyahoga County is showing a clear sign of

population decline during the same period. In Mecklenburg County, total population has increased dramatically with a near 40 percent increase from 2000 to 2014.

In terms of racial diversity, Cook County appears relatively diverse with 24.2, 6.6, and 24.5 percent of the population in 2014 being Black, Asian, and Latino, respectively. On the other hand, though Mecklenburg County has a large Black and Asian presence, the Latino population is quite low at 12.4 percent of the total population in 2014, while Cuyahoga County has a low presence of both Asian and Latino populations. In terms of immigration, Cook County's immigrant population of the total stands at 11.2 percent in 2014, while Cuyahoga County's immigrant population is extremely low at under 3 percent of the total population. In Mecklenburg County, though the percentage of immigrant population is less than that of Cook County, the figure has grown over 32 percent from 2000 to 2014.

All three counties show percentage increases in the percent of college graduates, however Cuyahoga's educational attainment rates are roughly on par with the national average, while the other two counties show much higher attainment rates. Also, though Cook and Mecklenburg County have median household incomes that are slightly above national averages in 2014, Cuyahoga County's median income level is nearly $10,000 below the national average.

Table 1. Demographic & Housing Characteristics of the Three Study Counties

Selected Characteristics	Cook County			Mecklenburg County			Cuyahoga County			USA TOTAL		
	2000	2014	% change	2000	2014	% change	2000	2014	% change	2000	2014	% change
Total Pop. (in 10,000s)	538	523	-0.03	70	97	0.39	139	127	-0.09	28,142	31,411	0.12
% Black	0.261	0.242	-7.33	0.279	0.309	10.80	0.274	0.296	8.09	0.123	0.126	2.41
% Asian	0.048	0.066	37.77	0.031	0.050	60.02	0.018	0.027	50.14	0.036	0.050	38.94
% Latino	0.199	0.245	23.15	0.065	0.124	91.20	0.034	0.051	49.71	0.125	0.169	35.16
% Non-U.S. Citizen	0.120	0.112	-6.80	0.070	0.092	32.34	0.028	0.028	2.21	0.066	0.071	7.41
Educational Attainment (25 yrs +) (% Bachelor's or higher)	0.280	0.353	26.07	0.371	0.415	11.86	0.251	0.303	20.72	0.244	0.293	20.08
% Below Poverty Level	0.135	0.172	27.41	0.092	0.155	68.48	0.131	0.185	41.22	0.124	0.156	25.81
Median Household Income	45,433	54,828	0.21	50,311	56,472	0.12	38,943	44,203	0.14	41,851	53,482	0.28
Median HH Income - Renters	30,634	34,540	0.13	33,113	36,286	0.10	24,144	24,721	0.02	27,362	33,219	0.21
Occupied Housing Units (in 1,000s)	1,974	1,937	-0.02	273	372	0.36	571	535	-0.06	105,480	116,211	0.10
% Owner Occupied Units	0.579	0.576	-0.54	0.623	0.587	-5.82	0.632	0.602	-4.78	0.662	0.644	-2.79
% Renter Occupied Units	0.421	0.424	0.75	0.377	0.413	9.62	0.368	0.398	8.21	0.338	0.356	5.46
Median Value of Owner-Occupied Housing Units with a Mortgage	157,700	227,000	0.44	141,800	184,400	0.30	113,800	127,200	0.12	119,600	193,500	0.62
Rental Vacancy Rate	0.053	0.072	35.85	0.087	0.060	-31.03	0.094	0.085	-9.57	0.068	0.069	1.47
Rental Vacancy Rate (2010-2014)	0.081*	0.072	-11.11	0.083*	0.060	-27.71	0.105*	0.085	-19.05	0.078*	0.069	-11.54

Source: Author's own calculations based on American Community Survey 2014 data and Decennial Census 2000 data.

*Rental vacancy rates from ACS 2010 data.

In regard to the housing market, the percentage of occupied housing units that are owner-occupied and renter-occupied have remained relatively constant at 58 and 42 percent, respectively, in Cook County from 2000 to 2014. However, the percentage of owner-occupied units have declined substantially in Mecklenburg and Cuyahoga County during the same period. This result has partially affected the rental vacancy rate for each county, where vacancy has declined quite substantially from 2010 to 2014. Also, though the median home value of owner-occupied housing units in Cook and Mecklenburg County have appreciated considerably from 2000 to 2014, home value appreciation was found to be quite low in Cuyahoga County, where the absolute median value in 2014 was considerably less than the averages of the other two counties and the national average.

Table 2. Dissimilarity Index (White/Black)

Year	Chicago MSA	Charlotte MSA	Cleveland MSA
1980	88.1	58.0	85.8
1990	84.4	54.7	82.8
2000	80.4	54.0	77.2
2010	75.2	53.1	72.6

Source: US2010 Project at Brown University - Residential Segregation Database

A comparison of residential segregation of the three metropolitan statistical areas (MSA) that encompass each study county is shown in Table 2. The dissimilarity index shown here measures the degree to which Blacks are distributed differently than Whites across census tracts in each MSA. A value of zero would indicate perfect integration, while a value of 100 would indicate complete segregation. It appears that index values

have decreased in all three MSAs over the past thirty years, however the Chicago and Cleveland MSAs have much higher index values compared to the Charlotte MSA. Usually an index value over 60 is considered very high, which is the case for Chicago and Cleveland MSAs with extreme index values of over 70.

A collective review of these findings suggest that each study county exhibits relatively different demographic and housing characteristics and may be distinguishable from each other. Cook County shows relatively stagnant growth in all demographic and housing areas, which in part should be due to its large population base. Mecklenburg County exhibits considerable population growth and increases in racial minority and immigrant population levels in the past 15 years. Finally, Cuyahoga County exhibits population decline during the same period, with very low racial diversity compared to the other two study counties. The county also exhibits median income values and median home values that are significantly below national averages, where also the median income for renters has remained relatively flat at only about $24,000 over the past 15 years.

Though the three counties may be distinguishable from one another, a further step has been taken to assess how representative these three counties are of all U.S. counties. A recent U.S. metropolitan typology report conducted by the Brookings Institution (2010) argues that the actual characteristics of a MSA are more important than its physical regional location, and has developed a seven category typology of MSAs in the U.S. They incorporate various socio-economic and demographic variables from Census data to develop their typology, though housing characteristics are notably absent.

As seen in Table 3, each MSA that encompasses the three study counties are all identified in different categories with similar characteristic descriptions (less housing) given above on each of the three study counties. A further in-depth review of their typology reveals that the Skilled Anchor MSAs are very similar to Industrial Core MSAs with minor differences, and that the New Heartland MSAs are somewhat similar to Mid-Sized Magnet MSAs though the future growth prospects of the former is considered much higher than the latter (Brookings Institution, 2010). Therefore if their typology constraints are relaxed to some degree, the analysis results of the three study counties may well be generalizable to most large U.S. metropolitan counties lying to the east of the U.S. central region.

Table 3. U.S. Metropolitan Area Typology (Brookings Institution)

Label	Metro Examples	Brief Description
Next Frontier	Washington, D.C.	Exceeds national averages on population growth, diversity and educational attainment.
New Heartland	Atlanta, Charlotte	Fast population growth and high educational attainment, but have lower shares of Hispanic and Asian populations than the national average.
Diverse Giant	NY, LA, Chicago	Above-average educational attainment and diversity, but below-average population growth.
Border Growth	Phoenix	Southern border metros with large and growing presence of Latin American immigrants.
Mid-Sized Magnet	Chattanooga, Boise	High population growth, but lower shares of Hispanic and Asian populations, and lower levels of educational attainment.
Skilled Anchors	Boston, Philly	Slow-growing, less diverse metros, but boast high levels of educational attainment.
Industrial Cores	Cleveland, Buffalo	Metros that are slow-growing, less diverse, and less educated than national averages.

Source: Brookings Institution Metropolitan Policy Program (2010) - State of Metropolitan America

Due to the observed heterogeneity among the three study areas, I conduct three separate panel data analyses for each study area as a combined model may lead to misleading results. In particular, since the number of census tracts in Cook County is more than double the other two counties combined, characteristics inherent to Cook County may suppress valuable findings from the other two counties.

Due to the limitations of available data for analysis, the study duration will be from 2007 through 2012 for the first two hypotheses and 2006 through 2011 for the final two hypotheses. The study years cover the first few years of the U.S. foreclosure crisis and carry through to its ebbing.

4.1.2. Units of Analysis

4.1.2.1. Geographical Unit – U.S Census Tracts

The majority of research in both HCV locations and foreclosures has utilized the census tract, which is used as a proxy for neighborhood as the unit of analysis. Moreover, the HCV data source is aggregated at the census tract level.

4.1.2.2. Stage of Foreclosure – Foreclosure Record of Sales

Since foreclosure is actually a process which begins with a notice of default and may (or may not) culminate in the actual sale of a property, it is important to identify which stage of foreclosure will be used in this analysis. Of the three primary stages of notice of default, notice of sale, and records of sale, I propose to look solely on foreclosure records of sale data (or sheriff's deeds), whether the property has been sold to

a third party or become bank-owned property (REO).[4] I find this stage as the most useful for my research since with regard to rental property, the displacement of a tenant due to foreclosure only occurs once their residential property is fully foreclosed upon and sold to an entity different from their current landlords.

4.1.3. Data Sources

4.1.3.1. HCV Residency Data (Dependent Variable)

In order to conduct the analysis, two primary data sets are needed to develop test samples: HCV residential data and foreclosure data. The total count of HCV units and foreclosures for each census tract under study is required. U.S. HUD has an extensive user-friendly database called 'A Picture of Subsidized Households (PSH)' which provides data to the census tract level for affordable housing programs administered by U.S. HUD for the years 1996 through 2012 (minus 1999), including the HCV program. Though HCV data are available on an annual basis after 2004, data prior to 2004 is not available in continuous years.[5] The PSH data for the HCV program include socio-economic and housing characteristics, as well as residency totals for HCV units and residents. However, it should be noted that PSH data are known for under-reporting of HCV residency counts, particularly for dense urban areas. Data files were downloadable from the PSH website.

[4] In this regard, throughout the research methodology section, when the loose term 'foreclosures' is used, it is meant to mean foreclosure record of sales (or sheriff's deeds).

[5] Prior to 2004, the closest available annual HCV data are for the year 2000.

4.1.3.2. Foreclosure Data

Foreclosure sales data were obtained through different sources for each respective study area counties. The Institute of Housing Studies at DePaul University graciously provided census tract-level foreclosure data for Cook County, Illinois. The data set gives total counts for foreclosure filings, sales, and REOs for each year from 2005 through 2011, and also differentiates totals between residential and commercial foreclosures. For Cuyahoga County (Ohio) foreclosure data, the NEO CANDO (abbreviated for 'Northeast Ohio Community and Neighborhood Data for Organizing') website managed by the Center on Urban Poverty and Community Development at Case Western University provides census tract level counts of residential sheriff's deeds.

Foreclosure sales data for Mecklenburg County (North Carolina) were obtained from the Mecklenburg Times, which reports foreclosure filing and sales data for the county. Both the Mecklenburg County Court and the Mecklenburg Sherriff's Office cite this newspaper as having the sole legal authority (within the county) to report foreclosure default notices and auction sales. The Mecklenburg Times (operated by The Dolan Company) is a subscription-based newspaper where all subscribers have access to their foreclosure database, which includes data on foreclosure filings, notice of sale, and report of sale for the county, as well as partial data for surrounding bordering counties. The database also has data as far back as 2001.

Though the data provided are substantial with each foreclosure case matched at the household-level with addresses attached to each case, they do not come with census tract identifiers (or any other geographical boundary identifiers). Therefore, ArcGIS was

used to match the addresses of foreclosure record of sale counts to its corresponding census tract.[6]

4.1.3.3. Additional Socio-Economic Predictor Variables Data

All additional independent predictor variables used in the analysis were retrieved or calculated from the U.S. Census' American Community Survey (ACS) 5-year estimates data.[7] By using the ACS 5-year estimate dataset for additional independent predictor variables, an extra step of data cleaning was required, because the ACS data beginning with the 2010 5-year estimates is ordered by the new 2010 Census Tract designation, while every dataset for the two primary variables of interest are ordered by 2000 Census Tract designations. Therefore, in order to preserve the quality of raw values for the primary variables of interest, those ACS 5-year estimate datasets with 2010 Census Tract designations were interpolated backwards to match 2000 Census Tract

[6] Before using ArcGIS, the raw data were cleaned by the following process. First, the foreclosure sales data have a column labeled 'Sale Type' with entries such as 'Sale,' 'No Sale,' 'Postponement,' 'Upset Bid,' 'Amended,' and 'Unidentified (i.e., empty cell)'. Among these types, only those with 'Sale' were selected. Second, the data have a column labeled 'Property Type' with entries to differentiate between commercial and residential properties. All commercial properties (e.g., churches, offices, warehouses, etc.) were omitted. Finally, parcels with missing addresses were further omitted, while addresses with missing postal codes were manually found using the U.S. Postal Service Zip Code Finder. The cleaned data were then geocoded using ArcGIS with an address locator found at: http://gis.ats.ucla.edu, as the current ArcGIS software doesn't support a free address locator. The initial auto-match yielded an approximately 85% match for each year of the available data. Unmatched addresses were further manually matched using the 'Interactive Rematch' function in ArcGIS, however even after this process the resulting match percentage for each year of data ranged from 88% through 96%.

[7] Beginning with the 2010 Census, most socio-economic data (particularly those questions asked in the long-form Census survey) has been transferred to the American Community Survey (ACS) from the traditional decennial Census. The ACS has 1-year, 3-year, or 5-year estimates, but only the 5-year estimates data provide information fully at the census tract level. Also, though the sample base of the 5-year estimates are much larger than that of 1-year or 3-year estimates, the sample size is still smaller than the decennial Census, which indicates that sample errors are also larger. As such, a tradeoff is being made for more current data, though it may have more measurement errors compared to the 2000 Census.

designations, instead of interpolating the HCV and foreclosure sales data to match 2010 Census Tract designations. This procedure was completed using Stata software developed and provided by the US2010 Project at Brown University.

4.1.4. Sample Size

As seen in Table 4, there are a total of 1,343 census tracts in Cook County, Illinois for which HCV data are available for the study duration. The foreclosure sales data reports on 1,313 census tracts. Cuyahoga County, Ohio has 501 census tracts with both HCV and foreclosure sales data reporting on all tracts. Mecklenburg County, North Carolina has 144 census tracts where both HCV and foreclosure sales data reports on all tracts as well. Again, census tracts are based on 2000 Census Tract designations.

Table 4. Number of Census Tracts in the Three Counties (Sample Size)

Cook County, Illinois				Cuyahoga County, Ohio				Mecklenburg County, NC			
YEAR	HCV	FCS	Matched	YEAR	HCV	FCS	Matched	YEAR	HCV	FCS	FCS
2006	1343	1313	1285	2006	501	501	496	2006	144	144	143
2007	1343	1313	1285	2007	501	501	496	2007	144	144	143
2008	1343	1313	1286	2008	501	501	496	2008	144	144	143
2009	1343	1313	1286	2009	501	501	496	2009	144	144	143
2010	1337	1313	1281	2010	501	501	496	2010	144	144	143
2011	1341	1313	1284	2011	501	501	496	2011	144	144	143
2012	1341	–	–	2012	501	–	–	2012	144	–	–
Total Matched Observations			7,707	Total Matched Observations			2,976	Total Matched Observations			858

In order to test hypotheses 3 and 4, various socio-economic data were retrieved from the 2012 ACS 5-year estimates dataset and then were interpolated to match 2000

Census tract designations. Upon completing this process, each variable for Cook County had varying total counts of observations ranging from 7,842 to 8,082 cases, which exemplifies that there are quite a few missing values spread across the observations of each variable's sample set. Cuyahoga County had varying total counts of observations ranging from 2,976 to 3,006 cases, while Mecklenburg County had varying total counts of observations ranging from 858 to 864 cases.

Additionally, due to the backwards interpolation used for ACS 2012 variables, some observations had unlikely values which were also omitted.[8] Also, since a lag of the foreclosure sales variable was proposed to be accommodated in the model, the first year (i.e., year 2005) with available data was omitted. Finally, once all variables were matched with valid values in the panel dataset, each of the three counties yielded a final sample size count of 7,707 observations over six years for Cook County, 2,976 observations over six years for Cuyahoga County, and 858 observations over six years for Mecklenburg County.

4.2. Methodology – Hypothesis 1 and 2

The following methodology pertains to these two hypotheses.

- Hypothesis 1 – Overall, on net, the distribution of HCV residencies after the foreclosure crisis was more spatially distributed than prior to the surge in foreclosures.

[8] For example, census tract 8411.04 in Cook County showed an African-American race percentage of 908%, which can't be possible. All observations with these types of issues have been omitted.

- Hypothesis 2 – Overall, on net, the distribution of HCV residencies after a period of high foreclosures will be less concentrated in high poverty (i.e., poverty rates of over 40 percent) tracts.

In order to estimate the relationship between concentrated foreclosure areas and the spatial distribution of HCV residencies, a longitudinal descriptive analysis was conducted for each of the three study counties, with ArcGIS mapping used for visualization purposes. Data available for the two variables of HCV residencies (the criterion variable) and foreclosures (the predictor variable) were studied over time on an annual basis, with the inclusion of poverty rates, percentage African-American, and percentage below U.S. HUD's Fair Market Rent variables, which were derived from the American Community Survey (ACS). Though I am not attempting to suggest causality with these two hypotheses, it makes little sense to simply compare the same-year data of the two primary variables, since it may take some time for a property that has been foreclosed upon to return to the housing market. Therefore, the foreclosure variable was compared to a one-year lag of the HCV variable (e.g., 2006 foreclosure data are compared to 2007 HCV data).

Results of this analysis allow for determining whether HCV residencies were concentrating or deconcentrating in the wake of the foreclosure crisis. While testing these two hypotheses will not suggest whether foreclosures may have affected the level of concentration of HCVs, it does provide critical contextual information simply by describing the changes over this period in the spatial distribution of HCV residencies.

4.2.1. The Criterion Variable Indicator

A simple count of HCV residencies in each tract is not the ideal indicator of tract-level HCV concentration. This is because we expect more HCV residencies where there are more rental units. Therefore the counts of HCV residencies for each census tract were first converted into a rate of HCV residencies per tract, where the rate was calculated as:

HCV residency rate = Total HCV count / Total renter occupied units

Then exploratory spatial data analysis (ESDA) was used to determine spatial clusters of HCV residencies by census tract. Two primary ESDA methods have been used in past HCV research to define concentration levels of HCV residencies: hot-spot analysis (e.g., Wang & Varady, 2005) and Local Moran's I statistics (e.g., Oakley & Burchfield, 2009). However, it would be difficult to conduct a hot-spot analysis, since it requires parcel-level data to estimate results.

Therefore, I followed Oakley & Burchfield's (2009) method of calculating the Local Moran's I statistic to determine spatial clusters of HCV residencies. The authors use Anselin's Local Moran's I statistic of spatial association, which identifies clusters of a particular feature with values similar in magnitude and spatial outliers (Anselin, 1998). In order to derive Local Moran's I values, Z-scores and p-values must be computed as they represent the statistical significance of these values. A statistically significant Local Moran's I value may indicate one of four types of clusters. These are shown below with descriptions relating to the topic of this analysis.

- High-high: Cluster of high values → High concentration of HCV residencies
- Low-low: Cluster of low values → Low concentration of HCV residencies
- High-low: Outlier where high value is surrounded by low values → High concentration of HCV residencies surrounded by low concentration census tracts
- Low-high: Outlier where low value is surrounded by high values → Low concentration of HCV residencies surrounded by high concentration census tracts

4.2.2. Primary Predictor Variable

As with the criterion variable, the count of foreclosures was converted to a rate of foreclosures by census tract, where the rate was calculated as:

Foreclosure sales rate = Total foreclosure sales count / Total mortgaged units

This allows one to closely follow Duda & Apgar's (2005) method by categorizing the foreclosure rate tract levels by thresholds, where in this dissertation the highest threshold would indicate tracts with high amounts of foreclosures, while the lowest group would indicate tracts with relatively low amounts of foreclosures.

4.2.3. Additional Predictor Variables – Poverty Rate

It is common in poverty studies to use a threshold measure of poverty rates (or levels), where it is widely accepted by policy researchers that 40 percent poverty levels indicate extremely high poverty, while poverty rates below 10 percent imply very low

levels of poverty. However, not much is known about neighborhoods that fall in between these two thresholds and are by large in many cases lumped into one category dubbed as "moderate poverty." However Devine et al. (2003) defines moderate poverty as those neighborhoods that have less than 20 percent poverty levels, while neighborhoods that fall in the 30 percent range are considered relatively to be in high poverty. Obviously, beyond the extremely high poverty threshold, the moderate ranges differ substantially by researcher to researcher. Though this may be the case, I propose to accept the poverty thresholds outlined by Devine et al. (2003).

Another important note is the limited availability of annual poverty data (or for that matter any other socioeconomic variable) at the census tract level. Since the analysis for the first two hypotheses will consist of an annual study of the key variables for the study duration, it is imperative to have annual poverty (and socioeconomic) data to analyze in tandem with the two primary variables of interest. Though annual poverty data are available with ACS 1-year estimates, the dataset doesn't report at the census tract level, with only the ACS 5-year estimates and the Decennial Census reporting at the tract level. However values derived from the 2000 Decennial Census were found to be too disjoint from the earliest available data year for the HCV and foreclosure sales variables data. Therefore only the ACS 5-year estimates were used to proxy for annual poverty (and socioeconomic) data:

- Year 2006 – Decennial Census 2000 data[9]
- Year 2007 – ACS 2009 5-year estimates data
- Year 2008 – ACS 2010 5-year estimates data
- Year 2009 – ACS 2011 5-year estimates data
- Year 2010 – ACS 2012 5-year estimates data
- Year 2011 – ACS 2013 5-year estimates data
- Year 2012 – ACS 2014 5-year estimates data

The U.S. Census Bureau does explicitly state that the ACS 5-year estimates data are an estimation indicative of all 5 years of the dataset and not for a particular year-point, even if it is the midpoint year of the 5-year period (U.S. Census Bureau, 2008). However, given the dearth of available data at the census tract level and the need for this data (especially for the denominator values to calculate HCV and foreclosure sales rates), using the Census data as proxies following the preceding description is the best available option.

4.2.4. Additional Predictor Variables – Percentage Black & FMR Rate

Two additional socioeconomic variables obtained from the ACS 5-year estimates datasets will be incorporated into the analysis to show for racial composition and the availability of affordable housing at the census tract level for each respective study area.

[9] The one exception made to use the 2000 Decennial Census was for the total mortgage unit variable in study year 2006. Linear interpolation was used to project 2006 values based on the 2000 Census data and available future year ACS 5-year estimates data. Given that results of an interpolation method are not technically factual, I have refrained from generating more sample points and study years.

The availability of affordable housing was determined as the percent of rental housing units below the U.S. HUD Fair Market Rent (FMR) guidelines, where all rental cash rents that were below a threshold figure in each respective county for each respective study year were summed by census tracts. The threshold was determined by using a county's FMR for a 2 bedroom apartment in a particular year as a proxy.[10] The following is a table of the FMRs for 2 bedroom units in each county for relevant analysis years.

Table 5. Fair Market Rent Price Thresholds for Two Bedroom Units

YEAR	Cook County, Illinois	Mecklenburg County, North Carolina	Cuyahoga County, Ohio
2006	$901	$680	$682
2007	$935	$707	$702
2008	$944	$740	$725
2009	$1,004	$757	$694
2010	$1,015	$806	$735
2011	$1,016	$819	$720
2012	$958	$791	$727

Once FMR counts by census tract were derived, the variable was converted to a rate of FMR by the following calculation:

Fair Market Rent (FMR) rate = Total FMR count / Total renter occupied units

[10] The U.S. HUD FMR guidelines provide annual FMR figures by number of unit bedrooms, where the 2 bedroom unit is in the middle among types (i.e., studio, 1BR, 2BR, 3BR, 4BR).

4.3. Methodology – Hypothesis 3 and 4

The following methodology pertains to the following hypotheses.

- Hypothesis 3 – Higher levels of foreclosures in a census tract increase the number of HCV units in the same neighborhood.
- Hypothesis 4 – Foreclosures in high socio-economic status (SES) and low-minority neighborhoods result in fewer HCV units than foreclosures in lower SES and high-minority neighborhoods.

4.3.1. Variable Description

The dependent variable for each of the three county panel studies is the count of the total number of HCV residencies in each census tract for each year of the predetermined analysis duration. The primary predictor variable is the count of the total number of foreclosure sales that occurred in each census tract in each year of the analysis duration. The literature review section of this dissertation addressed that several socio-economic variables were closely associated to both HCV residencies and foreclosures. Therefore these variables have been introduced into the model as control variables. The population count was also added as a control variable, since a larger census tract population may imply higher counts of HCV residencies. Furthermore, three additional control variables were included to control for housing structure characteristics and whether or not a tract lied within the central city (i.e., City of Chicago for Cook County, City of Cleveland for Cuyahoga County, and City of Charlotte for Mecklenburg County).

A collective list of the variables used in this analysis with variable descriptions is shown in Table 6.

Table 6. Variable Descriptions (by Census Tract)

Variables	Description
hcv (DV)	count of the total number of HCV residencies
fcsales	count of the total number of foreclosure sales
tpop	total population
pctblack	percent Black (or African-American)
pctasian	percent Asian
pctlatino	percent Latino (or Hispanic)
pctpubass	percent of families who have received public assistance income
medHHinc	median household income
pctfemalehh	percent female-headed households
pctunemp	unemployment rate
pctmoved	percent of residents in renter-occupied housing units who moved in the past year
pctrentocc	percent of renter-occupied homes
pctforborn	percent foreign-born residents
pcthudfmr	percent of rental housing units below the U.S. HUD FMR
pctvacancy	rental vacancy rate
pctpoverty	percent below federal-defined poverty level
medhsage	median age of housing unit
pctd1unit	percent renter-occupied units that are detached 1-unit homes
central	central city (dummy) / also explains source-of-income protection policy (for Chicago only*)

*No county, city or local SOI policies exist in Cuyahoga county and Mecklenburg county.

4.3.2. Regression Model Strategy – Hypothesis 3

Given that the dependent variable is the count of the total number of HCV residencies in each census tract for each year of study, estimation through linear models could be erroneous since the distribution of the error term is likely to be non-normal as negative integers are not permitted in the count of the dependent variable and the variable is heavily positively skewed. A Poisson regression model is appropriate because it

allows the modeling of dependent variables that describe count data and is often applied to study the occurrence of small number of counts as a function of a set of explanatory predictor variables (Cameron & Trivedi, 1998).

However, given the available datasets for the dependent variable, there is a high likelihood for overdispersion due to the number of samples with zero and very low (i.e., 1~5) counts. This would then violate a restrictive but major assumption of the Poisson model, where the conditional mean function equals the conditional variance function as shown below.

$$E[y_i|x_i] = \lambda_i = e^{x_i'\beta} = Var[y_i|x_i]$$

Overdispersion implies that the conditional variance of the dependent variable is greater than the conditional mean, which is not allowed with the Poisson model. Therefore, the proposed regression model is the negative binomial variant of the Poisson regression model shown below.

$$P(Y_i = y_i/\beta, x_i) = \frac{\tau(\theta + y_i)}{\tau(y_i + 1)\tau(\theta)}\left(\frac{\lambda_i}{\lambda_i + \theta}\right)^{y_i}\left(1 - \frac{\lambda_i}{\lambda_i + \theta}\right)^{\theta}$$

Where,

Conditional mean = λ_i

Conditional variance = $\lambda_i(1 + \eta^2\lambda_i)$ and $\eta^2 = \frac{1}{\theta}$

As such, the conditional mean function is,

$$E[y_i|x_i] = \lambda_i = e^{x_i'\beta}$$

And the conditional variance function is,

$$Var[y_i|x_i] = e^{x_i'\beta}\left(1 + \eta^2 e^{x_i'\beta}\right)$$

As seen, the negative binomial model is a more general model than the Poisson model. The negative binomial regression incorporates an additional variance parameter which if that value were equal to zero (i.e., parameter $\eta = 0$), it would collapse back to the Poisson model (which is rarely the case when working with relatively limited sample sizes). Using maximum likelihood, then one can estimate the regression parameter(s) β and the additional variance parameter η.

In order to control for the presence of heteroscedasticity, the robust covariance matrix estimator was used. Also, all time-invariant variables (i.e., data retrieved from the ACS 5-year estimates) were clustered at the census tract level, in order to control for serial auto-correlation and omitted variable bias. The fixed-effects model should lend greater inferential power to the singular effect of foreclosures on HCV residency distributions, and that this effect is not the result of the association of foreclosures with other predictor variables that in tandem affect the dependent variable.

Furthermore, a time-lagged (or more specifically a time-led) variable for the primary predictor variable (i.e., foreclosures) was included in the independent variable list, since it may be equally true that foreclosures that occurred in the previous year affect present year HCV residency distribution as much as those foreclosures that have occurred

in the present year. Only one step of lag is considered due to the relatively short study period; if additional lags were added it would result in significant sample size loss.

Finally, given these conditions, the following model is estimated in order to examine the relationship between HCV residencies and foreclosures.

$$\ln(HCV_i) = \beta_0 + \beta_1 fcsales_i + \beta_2 X_i + \varepsilon_i$$

Which can also be expressed as:

$$HCV_i = EXP(\beta_0 + \beta_1 fcsales_i + \beta_2 X_i + \varepsilon_i)$$
$$= EXP(\beta_0) * EXP(\beta_1 fcsales_i) * EXP(\beta_2 X_i) * EXP(\varepsilon_i)$$

In this model, $\ln(HCV_i)$ is the log of the count of the total number of HCV residencies in each census tract i, while $fcsales_i$ is the count of the total number of foreclosure sales in each tract i. The vector X_i is in part a set of additional socio-economic control variables that have been found to have an effect on HCV residencies in prior literature and are listed in Table 3. All socio-economic variables are from the ACS 2012, where most variables have been either directly retrieved or retrieved with minor calculations.

The percent of rental housing units below the U.S. HUD Fair Market Rent (FMR) guidelines was calculated by summing all rental cash rents that were below a threshold figure in each respective county. For Cook County the threshold figure was $958, which

was the county's FMR for a 2 bedroom apartment in 2012. The threshold figure for Cuyahoga County was $727, while the threshold figure for Mecklenburg County as $791 in 2012. Additional variables comprising vector X_i are the total population and housing structure characteristics such as the median age of housing unit and percent of renter-occupied units that are detached 1-unit homes. Finally, a dummy variable is also included which controls for the central city, where for only Cook County the central city dummy may also be interpreted as the presence (or absence) of Source-of-Income protection policies.

The SOI protection policy needs some clarification. Both Cook County and the City of Chicago have laws to protect individuals from discrimination on the basis of one's source of income. However, since 1993, only the City of Chicago SOI protection policy included the protection of those individuals using a Housing Choice Voucher, while Cook County exempted the protection of individuals with these vouchers, though the county recently passed an amendment to include protection for these voucher holders in August, 2013 (Chicago Area Fair Housing Alliance, 2014). Since this recent policy amendment occurred after the period of analysis in this dissertation, the dummy variable was arranged so that only the City of Chicago had the SOI protection policy. It should be further noted that while there are federal SOI protection policies for properties subsidized by some federal programs, neither Cuyahoga County (and its central city Cleveland) nor Mecklenburg County (and its central city Charlotte) have local SOI policies as of March, 2015, according to the Poverty & Race Research Action Council.

4.3.3. Regression Model Strategy – Hypothesis 4

In order to estimate the final hypothesis, interaction terms were introduced into the previously used negative binomial regression models in order to predict the effect of foreclosures on HCV count at different levels of socio-economic status. However, due to the limited sample size, the addition of too many interaction terms reduced the statistical power of the model (i.e., many variables including the interaction terms were found to be statistically insignificant). Therefore, in order to increase the statistical power of the models, the foreclosure variables were pooled into a 2-year variable and then log-transformed. Then, by process of elimination, it was found that having only one interaction term added to the previous regression models yielded statistically significant results for the interaction term. As a result, I report two models for each county with each model containing one socio-economic variable[11] that interacts with the 2-year pooled and logged foreclosure variable.

[11] I selected a few key independent variables, namely, percentage Black (or White), median household income, and percentage poverty to interact with the foreclosure variable. Though the selection may seem arbitrary, the selected variables are consistently the most common variables associated with socio-economic and racial indicators.

CHAPTER 5.

RESEARCH ANALYSIS AND FINDINGS

5.1. Hypothesis Testing 1

5.1.1. Cook County Results

5.1.1.1. Foreclosure Sales Trends in Cook County

As seen in Table 7, the total number of foreclosures in Cook County substantially increased with a peak figure of 20,658 in 2009, which is nearly twice the amount of foreclosures in 2007. Though foreclosure figures have somewhat decreased after reaching its peak in 2009, the totals are still much higher than 2007 and earlier. Also, though the city of Chicago has a lower share of all mortgaged units in the county (i.e., roughly 45 percent on average), the total number of foreclosure sales exceeds that of the suburbs for every study year. This is more clearly observed by the foreclosure sales rate, where at the peak year of 2009, 3.1 percent of all mortgaged units were foreclosed upon in Chicago compared to a 2 percent foreclosure sales rate in the suburbs. Overall, the foreclosure sales rate in Chicago exceeded that of the suburbs by about 1 percentage point during the years 2008 through 2010, and still by about 0.6 percent in the years 2007 and 2011.

Analyzing the foreclosure sales rate by census tracts show that there is an uneven distribution of foreclosures across Cook County. As seen in Table 8, foreclosure sales are disproportionately located in the city of Chicago, where the mean foreclosure sales rate was over 5 percent during the years 2008 through 2010, which was over twice the

Table 7. Foreclosure Sales Records for Cook County (2006~11)

Location	City of Chicago						Suburbs						Cook County (Total)					
Year	2006	2007	2008	2009	2010	2011	2006	2007	2008	2009	2010	2011	2006	2007	2008	2009	2010	2011
Total foreclosure sales records	3,331	6,195	9,689	11,256	10,857	8,098	2,930	4,629	7,295	9,402	8,900	7,616	6,261	10,824	16,984	20,658	19,757	15,714
Total mortgaged units	358,129	386,755	370,590	362,590	354,100	344,392	448,665	458,934	466,933	463,380	456,038	445,497	806,794	845,689	837,523	825,970	810,138	789,889
Foreclosure sales as a pct% of mortgaged units	0.93	1.60	2.61	3.10	3.07	2.35	0.65	1.01	1.56	2.03	1.95	1.71	0.78	1.28	2.03	2.50	2.44	1.99

Table 8. FC Sales as a Pct% of Mortgaged Units by Tracts in Cook Cnty (06~11)

Location	City of Chicago (n = 845)						Suburbs (n = 468)						Cook County (Total n = 1,313)					
Year	2006	2007	2008	2009	2010	2011	2006	2007	2008	2009	2010	2011	2006	2007	2008	2009	2010	2011
Mean foreclosure sales as a pct% of mortgaged units	2.53	3.30	5.02	5.77	5.54	4.19	0.90	1.37	2.01	2.55	2.28	1.95	1.95	2.61	3.94	4.62	4.38	3.39
Standard deviation	11.062	6.573	8.132	8.621	8.272	7.191	1.984	2.787	3.055	4.096	2.210	2.081	8.989	5.603	6.921	7.494	6.941	5.996

foreclosure sales rate of the suburbs for the same study years. As a result, the mean foreclosure sales rate in Chicago is clearly higher than the rate for the entire county during all study years, while the suburbs' rates were significantly lower.

The uneven distribution of foreclosure sales can be more clearly observed in Figure 3, which shows the percentage of mortgaged units that resulted in a foreclosure sale in Cook County. On average, census tracts with higher mean foreclosure sales rates can be found in clusters in the city of Chicago, with some elevated levels of foreclosure sales rates in the southern part of the county outside of Chicago. Also, it can be observed that the high mean foreclosure sales rates clusters in Chicago have grown in size to encompass most of the southern part of Chicago during the peak foreclosure sales years of 2008 and 2009.

5.1.1.2. Housing Choice Voucher (HCV) Trends in Cook County

On examining the spatial patterns of housing vouchers at the tract level over all study years (see Figure 4), I find that higher percentages of HCV households appear to concentrate in the south side of the city of Chicago and further extends into the south side of the suburbs of Cook County. This distribution pattern seems to hold relatively constant for all study years. However it does appear that HCV households have dispersed into most census tracts across the entire county although the distribution is clearly uneven.

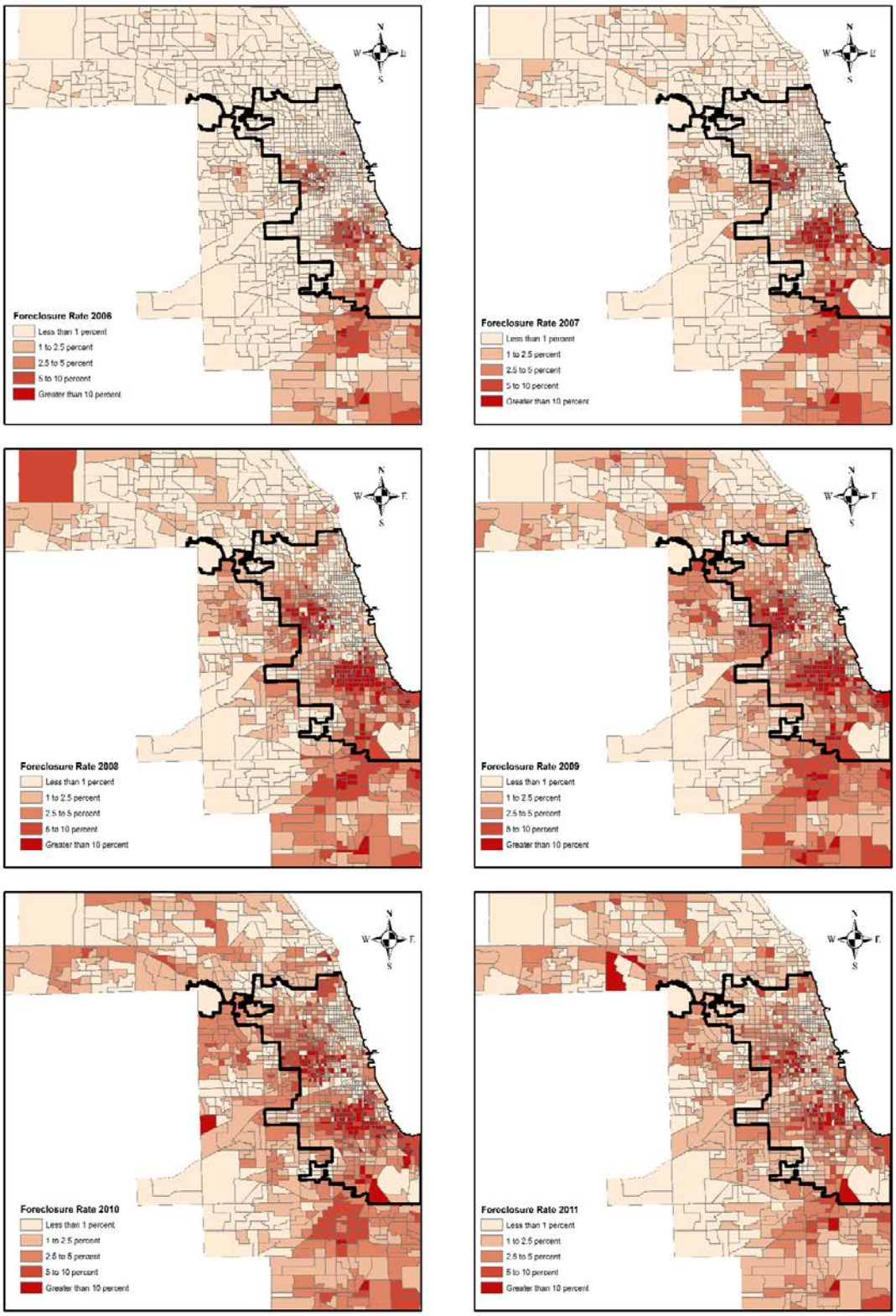

Figure 3. Spatial Distribution of Foreclosures in Cook County (2006~11)

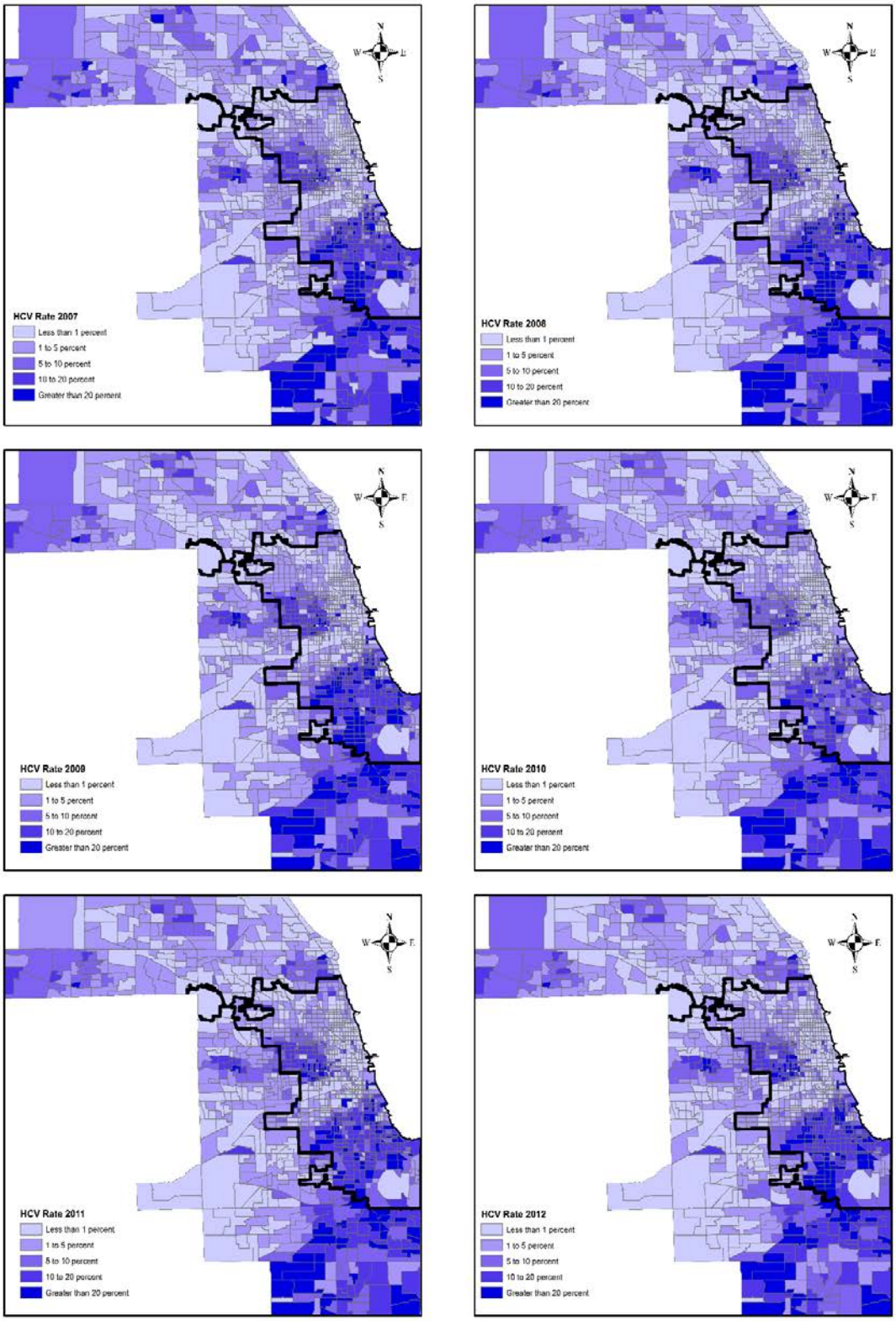

Figure 4. Spatial Distribution of HCVs in Cook County (2007~12)

A more in-depth analysis of the HCV data shows results that mirror the thematic maps in Figure 4. The total number of HCV households in Cook County has seen a modest increase of about 10 percent from 2007 to 2012, with an outstanding figure of 49,101 HCV households in 2012.[12] However, as seen in Table 9, approximately three-quarters of all HCV households in Cook County are in tracts within the city of Chicago. Though this may suggest that HCV households are concentrating in the central city, it should be noted that 70 percent of all renter-occupied units in Cook County are also in the city of Chicago, where the percentage of renter-occupied units with housing vouchers shows negligible difference between the central city and suburbs.

Similarly, the percentage of renter-occupied units under HUD's FMR also shows little difference between the city of Chicago and suburbs of Cook County, where FMR percentages in the city were in the 55 to 58 percent range before 2012, while percentages in the suburbs were slightly above 50 percent. The percentage of FMR units occupied by HCV households is also quite similar between the central city and suburbs with percentages varying between 10 and 11 percent before 2012, respectively. However, affordable housing trends in Cook County appear to be very discouraging. After 2009, the percentage of FMR units in both the city and suburbs have seen a steady decline with a precipitous drop in 2012 where much less than 50 percent of all renter-occupied units were deemed affordable. As a result, the percentage of HCV households living in affordable FMR housing units increased by nearly 2 percentage points in 2012 compared to previous years.

[12] HCV data for year 2010 exhibits departures from the norm compared to other years datasets. The issue appears to be a case of under-reporting by several census tracts in the city of Chicago.

Table 9. HCV Figures for Cook County (2007~12) (Number values * 1,000)

Location	City of Chicago							Suburbs							Cook County (Total)						
Year	2007	2008	2009	2010*	2011	2012	%Diff. 07-12	2007	2008	2009	2010	2011	2012	%Diff. 07-12	2007	2008	2009	2010*	2011	2012	%Diff. 07-12
Total HCV households	32.1	33.4	34.1	23.7	35.1	35.6	+10.99%	12.5	13.0	12.9	12.9	13.6	13.5	+7.40%	44.6	46.4	47.1	36.5	48.7	49.1	+9.98%
Total units renting below HUD's Fair Market Rent	313.6	302.2	321.8	319.1	314.3	277.3	-11.56%	105.7	110.0	123.2	122.2	121.5	103.3	-2.22%	419.3	412.2	445.0	441.3	435.8	380.6	-9.21%
Total renter-occupied units	551.5	544.9	552.3	560.8	568.0	574.6	+4.18%	210.4	221.5	225.9	232.5	237.2	246.9	+17.35%	761.9	766.4	778.1	793.3	805.2	821.5	+7.82%
FMR units as a percentage of all renter-occupied units	56.86%	55.46%	58.28%	56.89%	55.33%	48.27%		50.22%	49.67%	54.53%	52.56%	51.24%	41.84%		55.02%	53.78%	57.19%	55.62%	54.12%	46.34%	
HCV households as a pct% of FMR units	10.24%	11.06%	10.60%	7.41%	11.17%	12.85%		11.88%	11.83%	10.50%	10.54%	11.21%	13.04%		10.65%	11.27%	10.57%	8.28%	11.18%	12.90%	
HCV households as a pct% of all renter-occupied units	5.82%	6.13%	6.18%	4.22%	6.18%	6.20%		5.96%	5.88%	5.73%	5.54%	5.74%	5.46%		5.86%	6.06%	6.05%	4.61%	6.05%	5.98%	

*Note: HCV data for year 2010 exhibits departures from the norm compared to other year datasets. Upon further reviewing the dataset, I find that several tracts within the city of Chicago have figures that are much less than other year figures for the same years. In this regard, I am led to believe that this is an issue of under-reporting for some census tracts in Chicago. However, the data for suburban census tracts appear to be uniform to other years data for the same tracts.

Further analysis of the HCV dataset does show that there is indeed concentration and clustering of HCV households within a particular range of census tracts. As seen in Table 10, over 70 percent of all HCV households locate in tracts where more than 10 percent of all renter-occupied units are occupied by HCV households. The distribution is similar in the suburbs as well. In the suburbs, over 60 percent of all HCV households locate in tracts where more than 10 percent of renter-occupied units are HCVs. The more unsettling issue is that the share of HCV households in tracts where more than 20 percent of all renter-occupied units are HCVs, is increasing over time across the county. The city of Chicago accounts for most of this increase, where the percentage share has risen over 8 percentage points from 20.1 percent in 2007 to 28.6 in 2012.

Table 11 analyzes the distribution of census tracts by percentage of renter-occupied units with HCVs in Cook County. As can be seen, the percentage of tracts with no HCV households has steadily decreased over study years for the county from 14 percent in 2007 to 10 percent in 2012. HCV households appear to be gaining access to new neighborhoods in both the city of Chicago and suburbs, where the percentage of tracts with no HCV households have decreased by 4.4 percentage points in the city and 2.8 percentage points in the suburbs, respectively. Increasingly, HCV households also appear to be gaining more access to tracts with very low concentrations of HCV households. In 2012, 21 percent of all tracts in the county were located in neighborhoods where the percentage of renter-occupied units with housing vouchers was less than 1 percent, compared to 16.7 percent in 2007. Both the city and suburbs contributed to this increase, where the city percentage grew by over 2 percentage points to 19.5 percent and the suburbs increased by nearly 8 percentage points to 23.8 percent in 2012.

Table 10. Distribution of HCVs as a Pct% of Renters in Cook County (2007~12)

Location	City of Chicago							Suburbs							Cook County (Total)						
Year	2007	2008	2009	2010*	2011	2012	Diff. 07-12	2007	2008	2009	2010	2011	2012	Diff. 07-12	2007	2008	2009	2010*	2011	2012	Diff. 07-12
Less than 1 percent	1.72%	1.52%	1.63%	2.76%	1.73%	1.38%	-0.34	2.28%	2.22%	2.39%	2.21%	1.96%	2.86%	+0.58	1.87%	1.72%	1.84%	2.56%	1.79%	1.78%	-0.09
1 to 5 percent	14.58%	13.74%	14.00%	19.38%	12.87%	13.19%	-1.38	16.35%	17.99%	17.95%	18.33%	16.78%	16.24%	-0.11	15.07%	14.92%	15.08%	19.01%	13.97%	14.03%	-1.04
5 to 10 percent	14.62%	12.96%	11.73%	31.71%	14.04%	11.70%	-2.92	18.23%	17.60%	17.62%	19.84%	19.29%	20.26%	+2.02	15.63%	14.26%	13.35%	27.50%	15.52%	14.05%	-1.58
10 to 20 percent	48.98%	44.84%	44.86%	32.98%	43.09%	45.11%	-3.87	34.72%	29.12%	34.49%	32.72%	34.35%	33.13%	-1.59	44.99%	40.45%	42.01%	32.89%	40.63%	41.82%	-3.17
Greater than 20 percent	20.11%	26.94%	27.78%	13.17%	28.27%	28.62%	+8.51	28.42%	33.07%	27.55%	26.90%	27.62%	27.52%	-0.91	22.43%	28.65%	27.72%	18.04%	28.09%	28.32%	+5.88

*Note: HCV data for year 2010 exhibits departures from the norm compared to other year datasets. Upon further reviewing the dataset, I find that several tracts within the city of Chicago have figures that are much less than other year figures for the same years. In this regard, I am led to believe that this is an issue of under-reporting for some census tracts in Chicago. However, the data for suburban census tracts appear to be uniform to other years data for the same tracts.

Table 11. Distribution of Tracts by Percentage of Renter-Occupied Units with HCVs in Cook County (2007~12)

Location	City of Chicago (n = 874)							Suburbs (n = 469)							Cook County (Total n = 1,343)						
Year	2007	2008	2009	2010*	2011	2012	Diff. 07-12	2007	2008	2009	2010	2011	2012	Diff. 07-12	2007	2008	2009	2010*	2011	2012	Diff. 07-12
No HCV households	15.45%	15.22%	14.65%	13.39%	12.24%	11.07%	-4.37	11.16%	10.94%	12.02%	10.09%	8.80%	8.35%	-2.81	13.96%	13.73%	13.73%	12.24%	11.04%	10.12%	-3.84
Less than 1 percent	17.16%	16.93%	17.16%	21.74%	19.68%	19.49%	+2.33	15.88%	17.81%	17.60%	17.81%	19.31%	23.77%	+7.89	16.72%	17.24%	17.31%	20.37%	19.55%	20.99%	+4.27
1 to 5 percent	26.43%	25.40%	25.97%	27.80%	23.68%	25.14%	-1.29	37.55%	37.34%	36.27%	38.41%	36.91%	34.05%	-3.51	30.30%	29.55%	29.55%	31.49%	28.28%	28.26%	-2.04
5 to 10 percent	12.13%	11.78%	9.84%	18.31%	13.50%	11.53%	-0.59	14.59%	13.73%	14.59%	15.02%	15.88%	15.20%	+0.61	12.99%	12.46%	11.49%	17.16%	14.33%	12.82%	-0.17
10 to 20 percent	20.14%	20.14%	21.74%	15.45%	21.28%	20.65%	+0.51	12.66%	11.80%	12.88%	12.02%	12.23%	11.99%	-0.67	17.54%	17.24%	18.66%	14.25%	18.13%	17.62%	+0.08
Greater than 20 percent	8.70%	10.53%	10.64%	3.20%	9.50%	12.11%	+3.42	8.15%	8.80%	7.30%	7.30%	7.51%	6.64%	-1.52	8.51%	9.93%	9.48%	4.63%	8.81%	10.19%	+1.69

*Note: HCV data for year 2010 exhibits departures from the norm compared to other year datasets. Upon further reviewing the dataset, I find that several tracts within the city of Chicago have figures that are much less than other year figures for the same years. In this regard, I am led to believe that this is an issue of under-reporting for some census tracts in Chicago. However, the data for suburban census tracts appear to be uniform to other years data for the same tracts.

Although these results provide further evidence that HCV households are dispersing across all census tracts in the county, Table 11 also shows evidence of the uneven distribution of HCV households across all tracts. Though HCV households are increasingly making inroads into low HCV concentration tracts, over 25 percent of all tracts in the county are still situated in high HCV concentration tracts where over 10 percent of all renter-occupied units are HCV households. Also, given that roughly 6 percent of all renter-occupied units in the county are HCV households, the share of tracts portraying similar percentage levels (i.e., 1 to 10 percent range) are steadily decreasing over the study years. On the other end of the spectrum, tracts with less than 1 percent HCV concentration has increased by over 4 percentage points in the county, of which the tract share in the suburbs has increased nearly 8 percentage points.

The evidence gleaned from Table 11 can be further understood by a visual inspection of Figure 5, where the Local Moran's I statistic was derived from the percentage of renter-occupied units with HCV households data. As a reference, the area outlined in black is the boundary for the city of Chicago. Though high-high clusters of HCV households are found to a lesser extent in the central west side of the city, most of the clusters are primarily in the southern parts of the city of Chicago and extends further into the southern parts of Cook County. On the other hand, low-low clusters are primarily found around the north and northeast sides of the city of Chicago and extends to the further northern areas of the suburban county. Low-low clusters can also be found in the central western parts of the suburbs of Cook County.

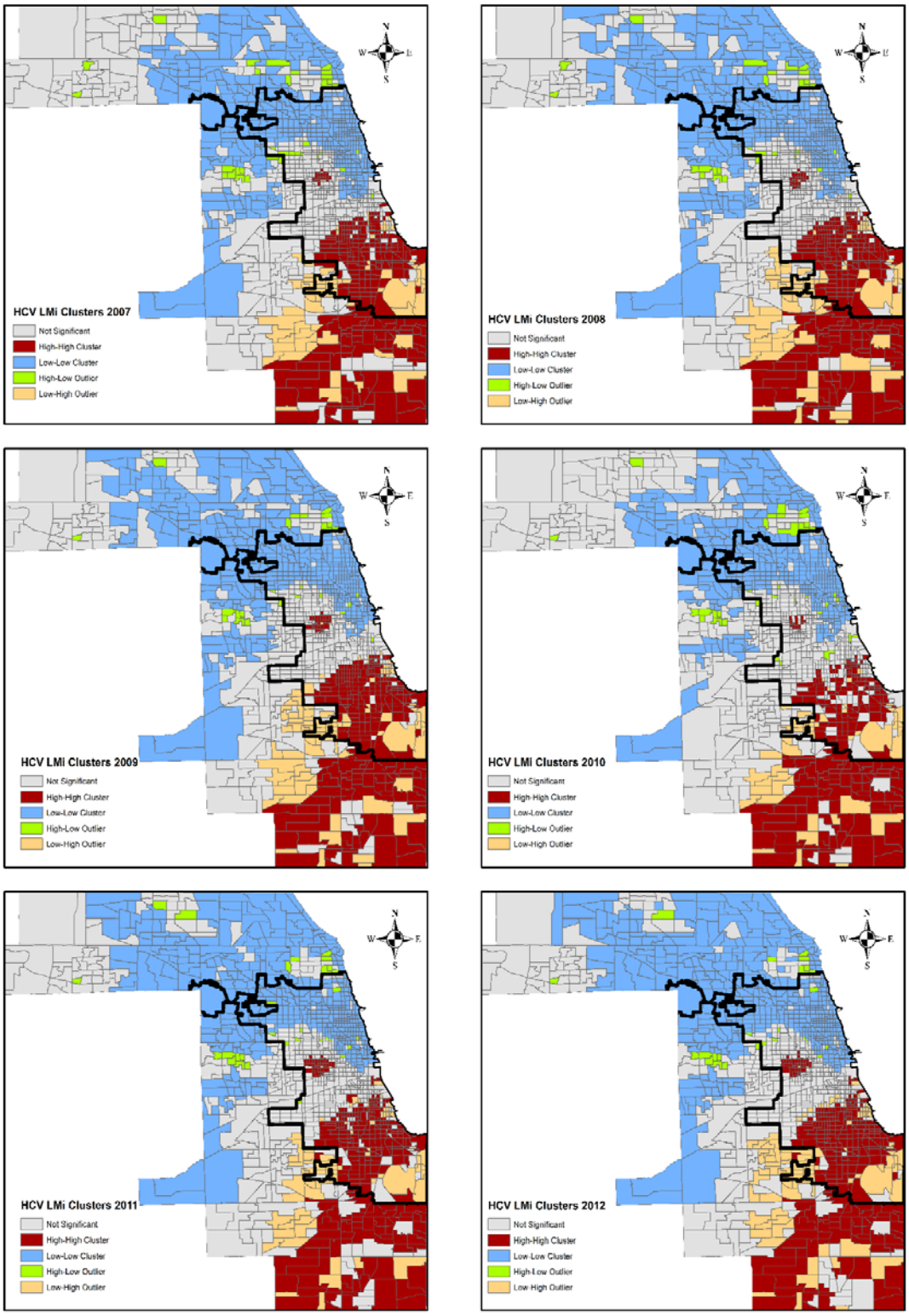

Figure 5. HCV Spatial Clusters in Cook County (2007~12)

These spatial clustering patterns indicate that tracts with higher percentages of HCV households tend to congregate in close proximity to other tracts with higher percentages, while lower percentages of HCV households tend to cluster with other tracts with lower percentages. Therefore as also evidenced in preceding tables and figures, the distribution of HCV households is uneven across both the central city and suburbs. The uneven distribution is even more striking when comparing the percentage of renter-occupied units with HCV households rates of high-high cluster areas and low-low cluster areas. As seen in Table 12, high-high clusters are situated in tracts with over 20 percent voucher housing, while low-low clusters are in tracts with only a 1 percent HCV households share or less. Also, closely mirroring this divide is the foreclosure sales rate. The foreclosure sales rate in high-high clusters is over twice the county averages, while the low-low clusters exhibit much lower rates compared to the county even though its rates have steadily increased during the study years.

Table 12. Comparison of HCV Clusters for Cook County (2007~12)

Item	HCVs as a Pct% of Renter-Occupied Units						Foreclosure Sales as a Pct% of Mortgaged Units					
Year	2007	2008	2009	2010*	2011	2012	2006	2007	2008	2009	2010	2011
Local Moran's I - High-High Clusters	21.22%	21.36%	21.62%	17.48%	21.16%	21.03%	4.54%	6.94%	9.66%	8.28%	8.20%	6.30%
Local Moran's I - Low-Low Clusters	0.96%	1.01%	1.04%	0.74%	1.04%	1.06%	0.28%	0.51%	1.03%	1.56%	1.81%	1.60%
Cook County Averages	5.86%	6.06%	6.05%	4.61%	6.05%	6.20%	1.95%	2.61%	3.94%	4.62%	4.38%	3.39%

*Note: HCV data for year 2010 exhibits departures from the norm compared to other year datasets. Upon further reviewing the dataset, I find that several tracts within the city of Chicago have figures that are much less than other year figures for the same years. In this regard, I am led to believe that this is an issue of under-reporting for some census tracts in Chicago. However, the data for suburban census tracts appear to be uniform to other years data for the same tracts.

5.1.2. Cuyahoga County Results

5.1.2.1. Foreclosure Sales Trends in Cuyahoga County

As seen in Table 13, the foreclosure crisis appears to have hit Cuyahoga County earlier than Cook County where the total number of foreclosure sales reached a peak figure of 10,020 in 2007 and then has steadily decreased over the study duration. In fact, total foreclosure figures in 2011 are lower than totals for 2006. Both the city of Cleveland and the suburbs mirror the foreclosure trends of the entire county, though total foreclosures are decreasing at a much slower pace in the suburbs. Also, though the city of Cleveland has only about 25 percent of all mortgaged units in the county, the city has accounted for roughly half of all foreclosure sales during the 6-year study duration. However, after accounting for 57 percent of all foreclosures in year 2007, the city's foreclosure share has steadily decreased to accounting for only 38 percent of all foreclosures in year 2011. This is more clearly observed by the foreclosure sales rate data. At the peak year of 2007, the city of Cleveland had a foreclosure sales rate of 9.31 percent, which was over three times higher than the 2.52 percent rate in the suburbs. However, that gap has been reduced significantly in subsequent years, where the city foreclosure sales rate is 3.19 percent in 2011 compared to 1.52 percent in the suburbs.

The mean foreclosure sales rate by census tracts exhibit trends comparable to that of the entire county. However, as seen in Table 14, the higher mean foreclosure rates suggest that there is an uneven distribution of foreclosures within and among all tracts. In particular, the 12 percent foreclosure sales rate in 2007 of Cleveland census tracts imply that some of these tracts experienced a much more elevated level of foreclosures compared to other within-city tracts.

Table 13. Foreclosure Sales Records for Cuyahoga County (2006~11)

Location	City of Cleveland						Suburbs						Cuyahoga County (Total)					
Year	2006	2007	2008	2009	2010	2011	2006	2007	2008	2009	2010	2011	2006	2007	2008	2009	2010	2011
Total foreclosure sales records	3,121	5,716	3,715	2,386	2,035	1,575	2,313	4,304	3,838	2,995	2,830	2,537	5,434	10,020	7,553	5,381	4,865	4,112
Total mortgaged units	59,962	61,411	55,300	53,520	50,961	49,382	169,756	170,461	174,653	170,839	168,954	167,016	229,719	231,872	229,953	224,359	219,915	216,398
Foreclosure sales as a pct% of mortgaged units	5.20	9.31	6.72	4.46	3.99	3.19	1.36	2.52	2.20	1.75	1.68	1.52	2.37	4.32	3.28	2.40	2.21	1.90

Table 14. FC Sales as a Pct% of Mortgaged Units by Tracts in Cuyahoga Cnty (06~11)

Location	City of Cleveland (n = 225)						Suburbs (n = 276)						Cuyahoga County (Total n = 501)					
Year	2006	2007	2008	2009	2010	2011	2006	2007	2008	2009	2010	2011	2006	2007	2008	2009	2010	2011
Mean foreclosure sales as a pct% of mortgaged units	6.46	12.12	8.13	5.44	4.65	3.44	2.04	3.96	3.09	2.24	2.15	2.11	4.02	7.63	5.35	3.68	3.27	2.71
Standard deviation	6.386	11.756	7.364	5.452	4.465	3.015	3.387	7.070	3.873	2.199	2.137	4.194	5.426	10.291	6.234	4.304	3.604	3.766

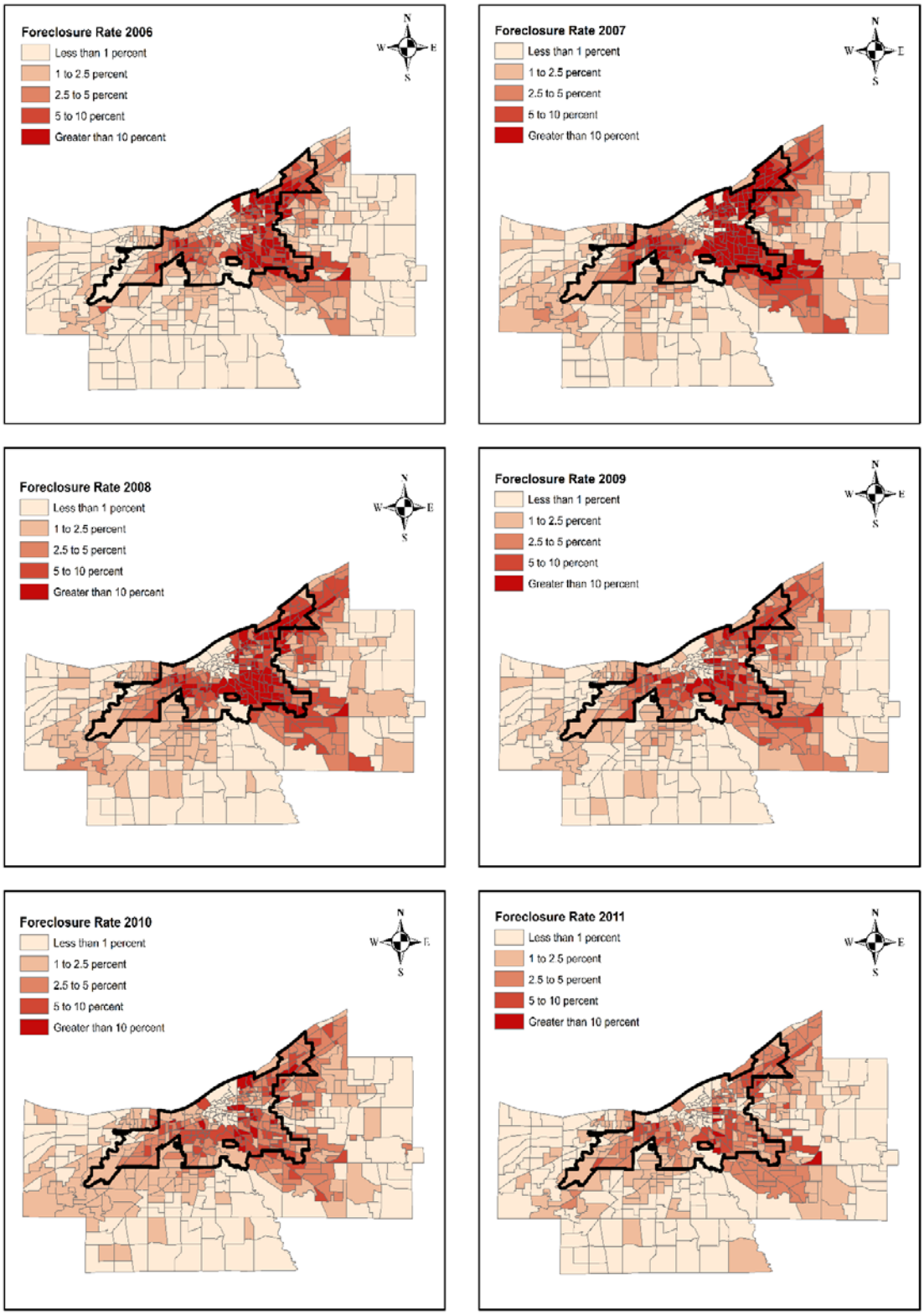

Figure 6. Spatial Distribution of Foreclosures in Cuyahoga County (2006~11)

The uneven distribution of foreclosure sales can be more clearly observed in Figure 6, which shows the percentage of mortgaged units that resulted in a foreclosure sale by census tract in Cuyahoga County. On average, tracts with higher mean foreclosure sales rates can be found extending from about the middle of the city of Cleveland to most of the eastern side of the city. As can be seen, elevated levels of foreclosure sales appear to remain concentrated within Cleveland boundaries, though a few inner-ring suburbs adjacent to the eastern side of Cleveland also appear to have high foreclosure rates. Also, foreclosure sales rates appear to gradually decline the further one moves away from the city.

5.1.2.2. Housing Choice Voucher (HCV) Trends in Cuyahoga County

The spatial patterns of housing vouchers at the tract level over all study years for Cuyahoga County (see Figure 7) exhibit similar features to that of Cook County. Higher percentages of HCV households appear to concentrate in the east side of the city of Cleveland and further extends into the adjacent inner-ring suburbs in the east side of Cuyahoga County. This distribution pattern seems to hold relatively constant for all study years. However it does appear that there are small clusters of HCV households in the western side of the city of Cleveland as well. Also, HCV households appear to have dispersed into most census tracts across the entire county, though the percentage of renter-occupied units that are HCV households gradually decrease as one moves further away from the city of Cleveland. As such, the spatial distribution of housing vouchers is clearly very uneven.

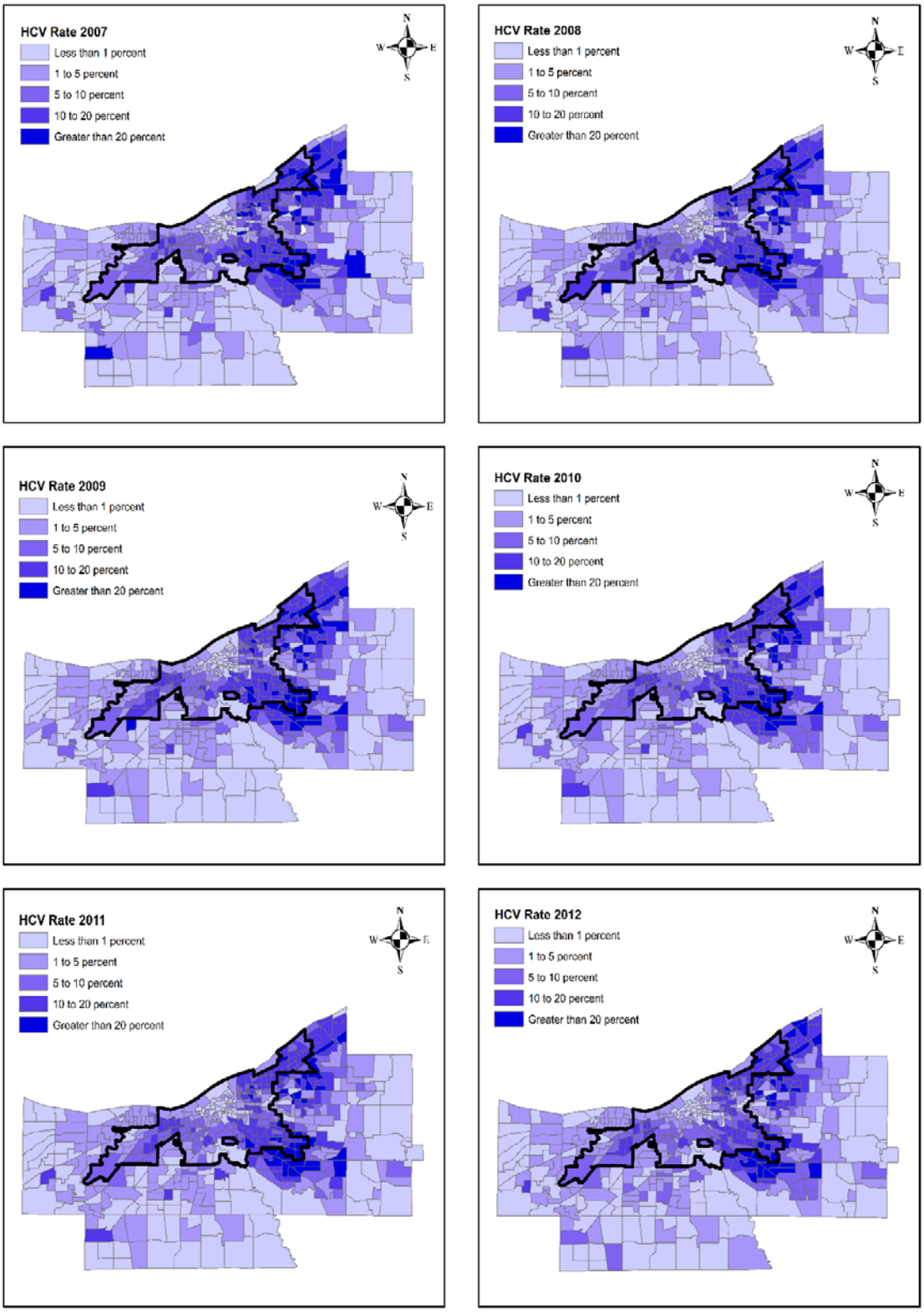

Figure 7. Spatial Distribution of HCVs in Cuyahoga County (2007~12)

Though Cuyahoga County appears to exhibit similar spatial patterns to that of Cook County in Figure 7, a more in-depth analysis of the HCV data reveals a much different picture. As seen in Table 15, the total number of HCV households in Cuyahoga County has remained relatively constant at a little over 15,000 households annually. However, there is a clear trend which shows that HCV households are steadily moving beyond Cleveland's city boundaries into the suburban areas of the county. While the city of Cleveland accounted for about 55 percent of all HCV households in the county in 2007 and 2008, those figures fell to about 50 percent in 2009 and 2010, and has further dropped to about a 48 percent share in 2011 and 2012. Overall, Cleveland has lost nearly 12 percent of its HCV household share, while the suburbs have gained 17.5 percent from 2007 to 2012. Also, renters in general appear to be following a similar pattern to that of the suburbanization of HCV households, where the amount of renter-occupied units in the city has slightly decreased while renter-occupied units in the suburbs has increased by nearly 11 percent during the study duration.

HCV households appear to be suburbanizing at a rapid pace despite the limited amount of affordable housing. In Cleveland, the total units renting below HUD's FMR decreased by over 7 percent from 2007 to 2012. In the suburbs, although the total number of renter-occupied units increased by nearly 11 percent during the study duration, the total number of affordable housing units remained relatively constant at slightly above 45,000 units. As a consequence, only a little over one-third (i.e., 38.28 percent) of all renter-occupied units in the suburbs were deemed affordable with an increasing percentage of HCV households residing in these affordable housing units.

Table 15. HCV Figures for Cuyahoga County (2007~12) (Number values * 1,000)

Location	City of Cleveland							Suburbs							Cuyahoga County (Total)						
Year	2007	2008	2009	2010	2011	2012	%Diff. 07-12	2007	2008	2009	2010	2011	2012	%Diff. 07-12	2007	2008	2009	2010	2011	2012	%Diff. 07-12
Total HCV households	8.4	8.0	7.9	7.6	7.4	7.4	-11.62%	6.8	6.8	7.3	7.7	7.8	8.0	+17.52%	15.1	14.9	15.3	15.3	15.1	15.4	+1.42%
Total units renting below HUD's Fair Market Rent	58.1	55.8	50.4	54.4	52.4	53.9	-7.26%	45.2	49.8	42.1	48.1	44.4	45.4	+0.46%	103.3	105.6	92.5	102.5	96.8	99.3	-3.88%
Total renter-occupied units	96.9	90.2	91.1	91.9	92.1	94.3	-2.76%	107.2	112.7	115.3	115.5	117.0	118.7	+10.76%	204.1	202.9	206.4	207.4	209.1	212.9	+4.34%
FMR units as a percentage of all renter-occupied units	59.94%	61.85%	55.31%	59.21%	56.93%	57.17%		42.21%	44.23%	36.52%	41.62%	37.91%	38.28%		50.63%	52.06%	44.82%	49.42%	46.29%	46.64%	
HCV households as a pct% of FMR units	14.40%	14.42%	15.72%	14.05%	14.06%	13.72%		14.98%	13.66%	17.42%	16.02%	17.50%	17.52%		14.65%	14.06%	16.49%	14.98%	15.64%	15.46%	
HCV households as a pct% of all renter-occupied units	8.63%	8.92%	8.70%	8.32%	8.00%	7.84%		6.32%	6.04%	6.36%	6.67%	6.64%	6.71%		7.42%	7.32%	7.39%	7.40%	7.24%	7.21%	

Further analysis of the HCV dataset reveals a declining concentration of housing vouchers in the city of Cleveland. As seen in Table 16, the share of HCV households living in census tracts where more than 20 percent of all renter-occupied units were occupied by HCV households, has been reduced by nearly 10 percentage points from 2007 to 2012. On the other hand, tracts which had 5 to 10 percent renter-occupied units with HCV households increased by over 8 percentage points during the same time-frame.

Though HCV concentration appears to be declining in the city, the exact opposite trend is exhibited in the suburbs, where there has been a nearly 11 percentage point increase in share of HCV households residing in tracts where more than 20 percent of all renter-occupied units were HCV households. In 2012, nearly half of all suburban HCV households resided in these extremely concentrated census tracts. Conversely, other suburban census tracts with lower concentrations of HCV households has seen a constant decline in the share of residing HCV households over the study duration.

When analyzing the trend patterns found in Table 16 in conjunction with Figure 7, it appears that though HCV households are rapidly moving into the suburbs, most of them are not getting very far. As seen in Figure 7, high concentrations of HCV households can be found in the inner-ring suburban tracts immediately adjacent to Cleveland's eastern boundaries beginning in the northeast area and extending all the way to the southeast area. Essentially, HCV households are dispersing from the central city only to re-concentrate in the inner-ring suburbs.

Table 16. Distribution of HCV as a Pct% of Renters in Cuyahoga County (2007~12)

Location	City of Cleveland							Suburbs							Cuyahoga County (Total)						
Year	2007	2008	2009	2010	2011	2012	Diff. 07-12	2007	2008	2009	2010	2011	2012	Diff. 07-12	2007	2008	2009	2010	2011	2012	Diff. 07-12
Less than 1 percent	0.45%	0.50%	0.49%	0.47%	0.56%	0.47%	+0.02	1.85%	2.09%	1.79%	1.71%	1.67%	1.76%	-0.09	1.08%	1.23%	1.11%	1.09%	1.13%	1.14%	+0.06
1 to 5 percent	7.71%	6.35%	6.93%	7.11%	8.49%	7.61%	-0.10	16.81%	14.85%	13.71%	13.01%	13.65%	12.64%	-4.18	11.78%	10.25%	10.18%	10.07%	11.14%	10.22%	-1.57
5 to 10 percent	21.91%	21.68%	22.51%	26.05%	28.04%	30.35%	+8.44	12.55%	12.19%	13.09%	12.44%	12.86%	12.97%	+0.43	17.72%	17.33%	17.98%	19.22%	20.25%	21.34%	+3.62
10 to 20 percent	53.83%	54.69%	55.05%	55.80%	52.12%	55.40%	+1.57	33.00%	29.26%	31.18%	33.63%	30.92%	25.92%	-7.08	44.51%	43.04%	43.58%	44.67%	41.24%	40.11%	-4.39
Greater than 20 percent	16.10%	16.77%	15.02%	10.57%	10.80%	6.17%	-9.93	35.79%	41.60%	40.23%	39.21%	40.90%	46.71%	+10.92	24.91%	28.15%	27.14%	24.94%	26.24%	27.19%	+2.28

Table 17. Distribution of Tracts by Percentage of Renter-Occupied Units with HCVs in Cuyahoga County (2007~12)

Location	City of Cleveland (n = 225)							Suburbs (n = 276)							Cuyahoga County (Total n = 501)						
Year	2007	2008	2009	2010	2011	2012	Diff. 07-12	2007	2008	2009	2010	2011	2012	Diff. 07-12	2007	2008	2009	2010	2011	2012	Diff. 07-12
No HCV households	10.67%	10.67%	10.22%	10.22%	10.22%	10.22%	-0.44	19.57%	18.12%	13.77%	12.68%	12.32%	11.23%	-8.33	15.57%	14.77%	12.18%	11.58%	11.38%	10.78%	-4.79
Less than 1 percent	4.89%	5.33%	6.67%	5.78%	6.67%	5.78%	+0.89	13.41%	15.22%	18.12%	18.12%	18.48%	19.57%	+6.16	9.58%	10.78%	12.97%	12.57%	13.17%	13.37%	+3.79
1 to 5 percent	18.67%	16.89%	16.44%	17.33%	19.56%	20.44%	+1.78	30.80%	30.80%	32.25%	33.33%	34.06%	34.06%	+3.26	25.35%	24.55%	25.15%	26.15%	27.54%	27.94%	+2.59
5 to 10 percent	25.33%	23.11%	23.11%	26.67%	26.22%	27.11%	+1.78	11.23%	10.14%	12.32%	10.87%	10.87%	11.96%	+0.72	17.56%	15.97%	17.17%	17.96%	17.76%	18.76%	+1.20
10 to 20 percent	30.22%	35.11%	35.11%	33.78%	31.56%	33.33%	+3.11	14.49%	14.86%	12.68%	14.49%	14.49%	12.32%	-2.17	21.56%	23.95%	22.75%	23.15%	22.16%	21.76%	+0.20
Greater than 20 percent	10.22%	8.89%	8.44%	6.22%	5.78%	3.11%	-7.11	10.51%	10.87%	10.87%	10.51%	9.78%	10.87%	+0.36	10.38%	9.98%	9.78%	8.58%	7.98%	7.39%	-2.99

Table 17 analyzes the distribution of census tracts by percentage of renter-occupied units with HCVs in Cuyahoga County. The distribution appears fairly normal with the bulk of tracts having between 1 and 20 percent of renter-occupied units occupied by HCV households. There has been a steady decrease in the share of tracts with no HCV households in the county, where about 11 percent of tracts have no HCV tenants in 2012. The suburbs primarily account for this decrease, where the share of tracts with no HCV households has dropped over 8 percentage points. Census tracts without HCV households in the city of Cleveland have held relatively steady at slightly above 10 percent. HCV households are also increasing their presence in neighborhoods with low housing voucher shares, particularly in suburban neighborhoods. In the suburbs, the share of tracts with less than 1 percent of renter-occupied units claimed by HCV households increased by 6 percentage points to 19.6 percent during the study duration.

At the other end of the distribution, the share of tracts with extreme HCV household presence has decreased by over 7 percentage points in the city of Cleveland to just 3.1 percent, while the suburban tract share has remained relatively constant at right under 11 percent throughout the study duration. Though these findings are promising at first glance, when analyzed in conjunction with previous findings on the HCV distribution in the suburbs, there appears to be some cause for concern. Essentially, by summarizing the findings of Table 16 and 17, one finds that nearly half of all suburban HCV households live in only a handful of census tracts which exhibit extreme HCV household concentrations. As such, though the distribution of HCV households in Cuyahoga County exhibit different characteristics and patterns compared to Cook County, the distribution is nonetheless uneven.

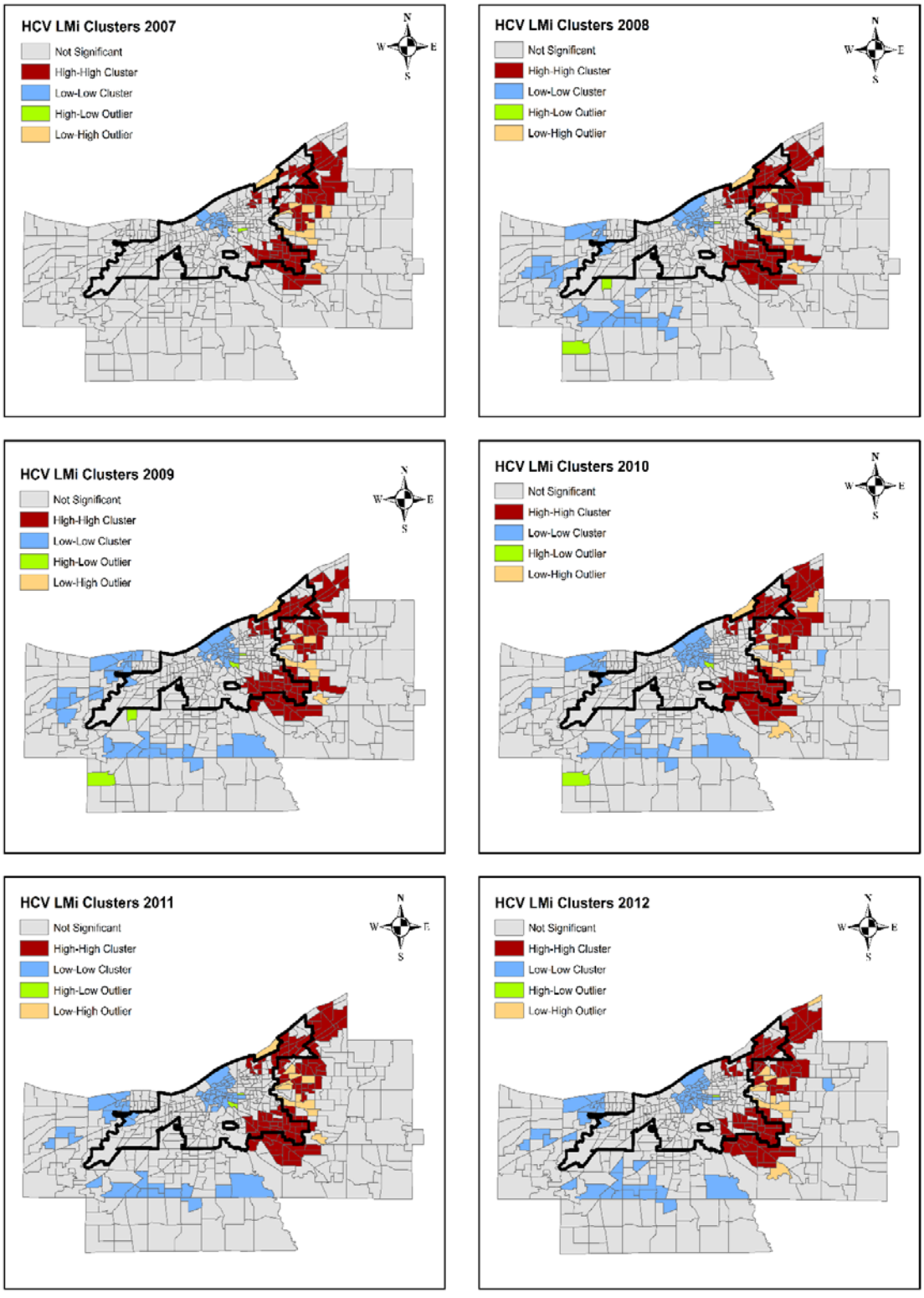

Figure 8. HCV Spatial Clusters in Cuyahoga County (2007~12)

The evidence found in preceding tables can be further understood by a visual inspection of Figure 8. As expected, high-high clusters of HCV households are found in the eastern parts of the city of Cleveland and the inner-ring suburbs immediately adjacent to Cleveland's eastern boundaries. On the other hand, low-low clusters are identified to be in suburban census tracts further in the south of Cuyahoga County and in suburbs adjacent to the western boundaries of the city of Cleveland. Low-low clusters are also present in the central northern area of the city of Cleveland, which appears to be Cleveland's downtown central business district. As such, though Cuyahoga County has witnessed a much more pronounced dispersal of HCV households into suburban areas compared to Cook County, the spatial distribution of housing vouchers across the county is markedly uneven.

Table 18. Comparison of HCV Clusters in Cuyahoga County (2007~12)

Item	HCVs as a Pct% of Renter-Occupied Units						Foreclosure Sales as a Pct% of Mortgaged Units					
Year	2007	2008	2009	2010	2011	2012	2006	2007	2008	2009	2010	2011
Local Moran's I - High-High Clusters	25.16%	20.95%	21.35%	20.77%	19.88%	19.34%	6.75%	14.55%	8.91%	5.24%	4.87%	3.85%
Local Moran's I - Low-Low Clusters	0.23%	0.50%	0.52%	0.57%	0.51%	0.49%	0.21%	0.96%	0.90%	0.96%	0.69%	0.75%
Cuyahoga County Averages	7.42%	7.32%	7.39%	7.40%	7.24%	7.21%	4.02%	7.63%	5.35%	3.68%	3.27%	2.71%

As seen in Table 18, it may be obvious that HCV rates are extremely higher in high-high cluster tracts compared to low-low cluster tracts. However, the stark difference between the foreclosure sales rates for the two cluster types suggests that high-high cluster tracts are comparatively much poorer than low-low cluster tracts. This will be analyzed more closely by testing the second hypothesis.

5.1.3. Mecklenburg County Results

Comparatively, the spatial relationship between the city of Charlotte and Mecklenburg County is different from the other two study areas. Both the cities of Chicago and Cleveland are fully situated in their respective counties and account for two-thirds and less than half of all their counties' census tracts. However, although the city of Charlotte is also fully situated in Mecklenburg County, the city comprises virtually the entire county. Among the 144 census tracts in the county, a total of 135 tracts are either fully or partially within Charlotte city boundaries. This leaves only 9 census tracts that lie outside of Charlotte, but are still part of Mecklenburg County. Due to the limited amount of suburban tracts, a city versus suburb comparison analysis becomes impossible with only tract data for the county. As a result, the analysis for this study area may result in a less finer description of the inherent spatial patterns, trends and distribution of HCVs and foreclosures.

5.1.3.1. Foreclosure Sales Trends in Mecklenburg County

As seen in Table 19, the total number of foreclosures in Mecklenburg County substantially increased in the study years of 2009 and 2010 with a peak figure of 8,465 in 2010, which was nearly four times the amount of the average number of foreclosures in non-peak years. However, it appears that crisis mitigation was swift as the total number of foreclosures in 2011 returned to the pre-peak levels before 2009. As may be obvious, the foreclosure trends of the city of Charlotte mirrored county trends. Also, though only comprising of 9 census tracts, the rest of Mecklenburg County also exhibited the same foreclosure trends in line with the entire county.

Table 19. Foreclosure Sales Records for Mecklenburg County (2006~11)

Location	City of Charlotte						Suburbs						Mecklenburg County (Total)					
Year	2006	2007	2008	2009	2010	2011	2006	2007	2008	2009	2010	2011	2006	2007	2008	2009	2010	2011
Total foreclosure sales records	2,621	2,433	1,975	4,680	7,891	2,352	99	85	75	307	574	128	2,720	2,518	2,050	4,987	8,465	2,480
Total mortgaged units	155,817	162,348	159,278	160,248	159,351	156,727	18,782	20,144	20,672	20,826	21,145	20,120	174,600	182,492	179,950	181,074	180,496	176,847
Foreclosure sales as a pct% of mortgaged units	1.68	1.50	1.24	2.92	4.95	1.50	0.53	0.42	0.36	1.47	2.71	0.64	1.56	1.38	1.14	2.75	4.69	1.40

Table 20. FC Sales as a % of Mortgaged Units by Tracts in Mecklenburg Cnty (06~11)

Location	City of Charlotte (n = 135)						Suburbs (n = 9)						Mecklenburg County (Total n = 144)					
Year	2006	2007	2008	2009	2010	2011	2006	2007	2008	2009	2010	2011	2006	2007	2008	2009	2010	2011
Mean foreclosure sales as a pct% of mortgaged units	2.20	2.06	1.57	3.40	6.02	1.88	0.45	0.41	0.34	1.52	2.70	0.60	2.09	1.96	1.50	3.28	5.81	1.80
Standard deviation	2.647	2.729	2.167	2.692	4.734	1.768	0.342	0.175	0.248	0.610	0.973	0.251	2.599	2.673	2.120	2.650	4.659	1.741

Analyzing the foreclosure sales rate by census tracts show that there is an uneven distribution of foreclosures across Mecklenburg County, though less pronounced compared to the other two study counties. As seen in Table 20, on average the mean foreclosure sales rate by census tracts is approximately 0.5 percentage points higher compared to the average rate for the entire county. In the peak foreclosure year of 2010, the rate difference exceeds a full percentage point. This implies that there are a group of tracts that exhibit much more elevated percentage levels of mortgaged units that resulted in a foreclosure sale, and that these tracts account for the foreclosure sales rate difference between county and by tract averages.

The uneven distribution of foreclosure sales can be clearly observed by the spatial patterns and trends shown in the following figure. Figure 9 shows the percentage of mortgaged units that resulted in a foreclosure sale in Mecklenburg County for the study duration with a one-year lag. On average, census tracts with higher mean foreclosure sales rates appear to crescent the northern area adjacent to downtown Charlotte. Also, less elevated levels of foreclosure sales rates extend throughout the northern parts of the city. Conversely, tracts in the southern part of the city of Charlotte and Mecklenburg County exhibit very low foreclosure sales rates compared to northern tracts.

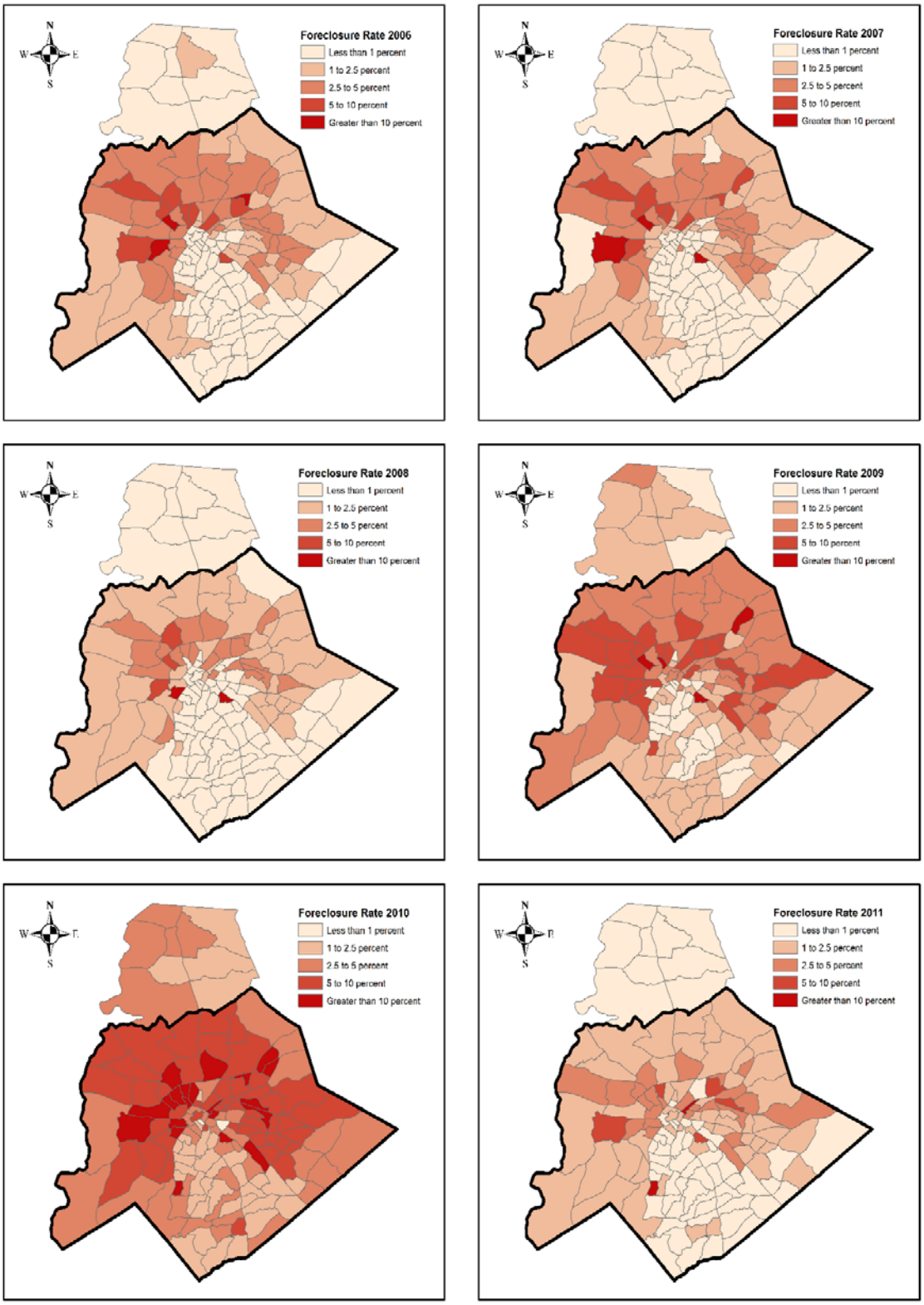

Figure 9. Spatial Distribution of Foreclosures in Mecklenburg County (2006~11)

5.1.3.2. Housing Choice Voucher (HCV) Trends in Mecklenburg County

It appears that the spatial patterns of housing vouchers and foreclosure sales exhibit a much more pronounced overlap compared to the other two study counties. On examining the spatial patterns of housing vouchers at the tract level over all study years (see Figure 10), higher percentages of HCV households appear to crescent the northern area adjacent to downtown Charlotte which is more or less the same pattern exhibited by the tracts with high foreclosure sales rates. Also, less elevated percentage levels of HCV households can be found extending to the northern parts of the city of Charlotte.[13] It also appears that HCV households have not been able to disperse into a large share of tracts clustered in particular areas. Tracts beginning in Charlotte's southern downtown area and extending further into the south exhibit extremely low HCV presence. The same can be said for those suburban tracts that are not a part of Charlotte as well. As such, the uneven distribution of HCV households appears much more pronounced in Mecklenburg County compared to the other two study counties.

Table 21 shows that though the total number of HCV households increased by over 25 percent from 2007 to 2012, the share of HCV households among all renter-occupied units remained relatively constant throughout the study duration as the total number of renter-occupied units also increased substantially during the same time-frame. Also, affordable housing appears to be at a premium as FMR units only account for about one-third of all renter-occupied units in the county for all study years, with HCV households accounting for 11 percent of those affordable units in 2012.

[13] HCV data for year 2011 exhibits departures from the norm compared to other year datasets. The issue appears to be a case of under-reporting by several census tracts in the city of Charlotte. The actual total count should be somewhere in between the counts for 2010 and 2012.

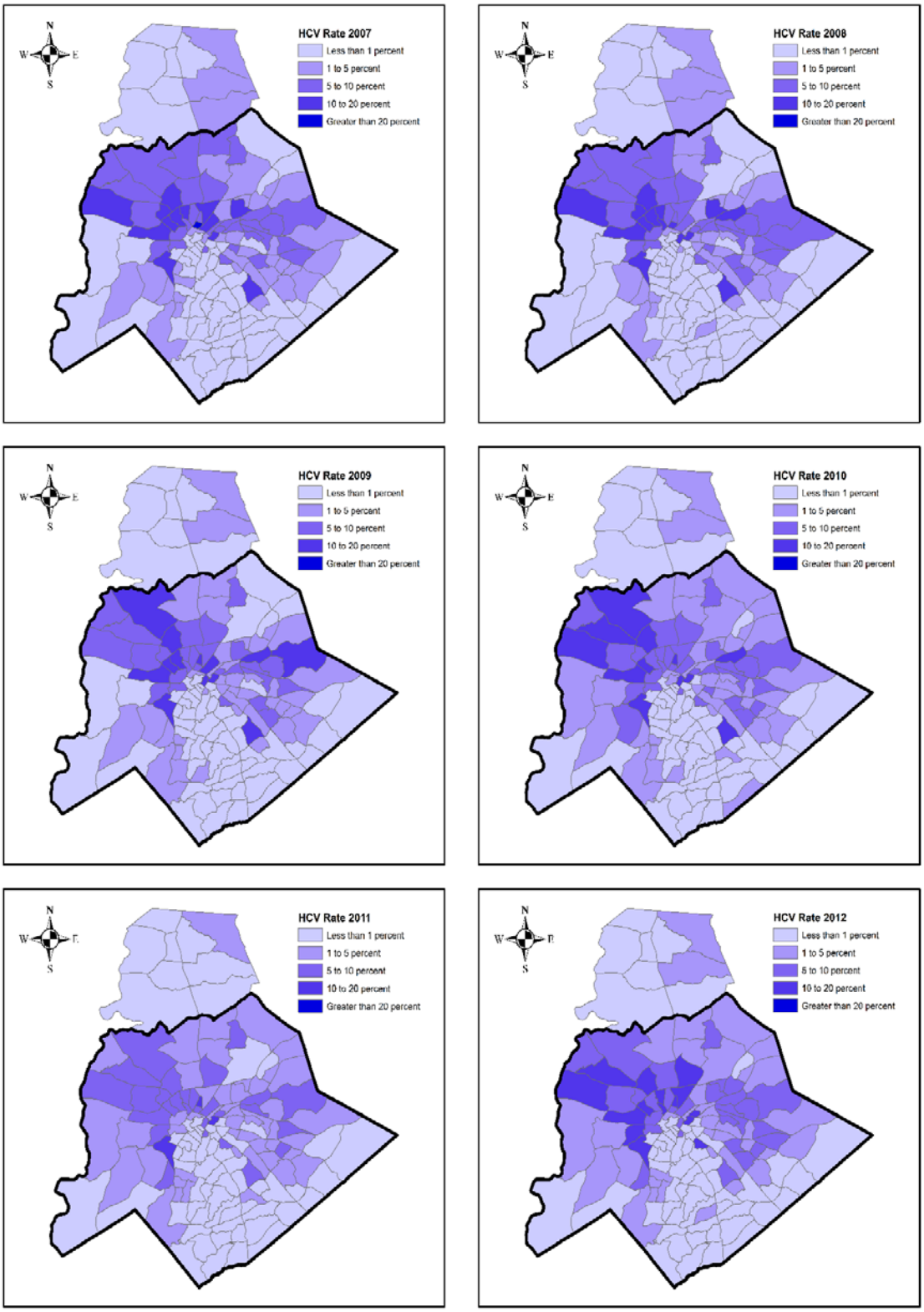

Figure 10. Spatial Distribution of HCVs in Mecklenburg County (2007~12)

Table 21. HCV Figures for Mecklenburg County (2007~12) (Number values * 1,000)

Location	City of Charlotte							Suburbs							Mecklenburg County (Total)						
Year	2007	2008	2009	2010	2011*	2012	%Diff. 07-12	2007	2008	2009	2010	2011	2012	%Diff. 07-12	2007	2008	2009	2010	2011*	2012	%Diff. 07-12
Total HCV households	4.32	4.43	4.33	4.85	3.74	5.44	+26.00%	0.05	0.05	0.04	0.04	0.03	0.05	+0.00%	4.36	4.48	4.37	4.89	3.77	5.49	+25.72%
Total units renting below HUD's Fair Market Rent	40.3	44.2	44.0	52.7	54.7	47.1	+16.90%	1.3	1.7	1.6	2.2	2.2	1.5	+8.22%	41.7	45.9	45.6	54.9	56.9	48.6	+16.62%
Total renter-occupied units	123.6	123.8	128.3	133.8	139.3	144.4	+16.76%	6.9	7.2	7.8	8.2	9.1	9.3	+35.71%	130.5	131.1	136.1	142.0	148.4	153.7	+17.76%
FMR units as a percentage of all renter-occupied units	32.62%	35.67%	34.29%	39.41%	39.27%	32.66%		19.47%	23.10%	19.89%	27.05%	24.16%	15.53%		31.93%	34.98%	33.47%	38.70%	38.34%	31.62%	
HCV households as a pct% of FMR units	10.70%	10.03%	9.83%	9.21%	6.83%	11.53%		3.58%	3.05%	2.44%	1.76%	1.22%	3.31%		10.47%	9.77%	9.58%	8.91%	6.61%	11.29%	
HCV households as a pct% of all renter-occupied units	3.49%	3.58%	3.37%	3.63%	2.68%	3.77%		0.70%	0.70%	0.49%	0.47%	0.30%	0.51%		3.34%	3.42%	3.21%	3.45%	2.54%	3.57%	

*Note: HCV data for year 2011 exhibits departures from the norm compared to other year datasets. Upon further reviewing the dataset, I find that several tracts within the city of Charlotte have figures that are much less than other year figures for the same years. In this regard, I am led to believe that this is an issue of under-reporting for some census tracts in Charlotte. The actual figure should be somewhere between year 2010 and 2012 data. However, the data for suburban census tracts appear to be uniform to other years data for the same tracts.

A more in-depth analysis of the HCV dataset shows results that mirror the spatial patterns identified in Figure 10. As seen in Table 22, roughly 45 percent of all HCV households in the county locate in census tracts where 5 to 10 percent of all renter-occupied units are HCVs, though that share has decreased by about 3 percentage points from 2007 to 2012. On average, about 25 percent of HCV households reside in tracts that have between a 1 to 5 percent HCV share among renter-occupied units. The percentage of HCV households in tracts with 10 to 20 percent HCV presence is also about 25 percent. The distribution is distinct compared to the other study counties in that there are no tracts in the county with an extreme presence of HCV households (i.e., over 20 percent HCV presence). This suggests that the distribution of HCV households in Mecklenburg County is relatively more even compared to other study counties, though the percentage of HCVs in tracts with less than 1 percent HCV presence is quite low.

Table 23 analyzes the distribution of census tracts by percentage of renter-occupied units with HCVs in Mecklenburg County. As can be seen, the percentage of tracts with no HCV households has held relatively constant at about 20 percent across all study years. Also, there are roughly the same amount of tracts that have less than 1 percent, 1 to 5 percent, and 5 to 10 percent HCV household presence. The share of tracts that exhibit a 10 to 20 percent HCV household presence stands at about a 10 percent share across the study duration. As such, though extreme concentrations of HCV households are not found in Mecklenburg County, the distribution is still very much uneven within the county. Also, it appears that HCV households in this particular county are either relatively committed to their current residence or are finding it difficult to move as both tables exhibit almost the same share distribution for all study years.

Table 22. Distribution of HCV as a Pct% of Renters in Mecklenburg Cnty (07~12)

Location	City of Charlotte							Suburbs							Mecklenburg County (Total)						
Year	2007	2008	2009	2010	2011*	2012	Diff. 07-12	2007	2008	2009	2010	2011	2012	Diff. 07-12	2007	2008	2009	2010	2011*	2012	Diff. 07-12
Less than 1 percent	3.34%	5.03%	4.51%	2.41%	5.24%	2.57%	-0.76	25.00%	29.41%	26.32%	30.77%	66.67%	31.25%	+6.25	3.58%	5.31%	4.70%	2.64%	5.68%	2.83%	-0.75
1 to 5 percent	24.82%	22.60%	28.96%	30.12%	45.45%	26.95%	+2.12	75.00%	70.59%	73.68%	69.23%	33.33%	68.75%	-6.25	25.37%	23.14%	29.35%	30.43%	45.37%	27.31%	+1.94
5 to 10 percent	48.53%	46.68%	42.69%	45.20%	44.78%	44.97%	-3.56	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00	47.99%	46.15%	42.31%	44.84%	44.46%	44.58%	-3.42
10 to 20 percent	23.15%	25.69%	23.85%	22.27%	4.52%	25.51%	+2.36	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00	22.90%	25.40%	23.64%	22.09%	4.49%	25.29%	+2.39
Greater than 20 percent	0.16%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.16	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00	0.16%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.16

*Note: HCV data for year 2011 exhibits departures from the norm compared to other year datasets. Upon further reviewing the dataset, I find that several tracts within the city of Charlotte have figures that are much less than other year figures for the same years. In this regard, I am led to believe that this is an issue of under-reporting for some census tracts in Charlotte. The actual figure should be somewhere between year 2010 and 2012 data. However, the data for suburban census tracts appear to be uniform to other years data for the same tracts.

Table 23. Distribution of Tracts by Percentage of Renters with HCVs in Mecklenburg County (2007~12)

Location	City of Charlotte (n = 135)							Suburbs (n = 9)							Mecklenburg County (Total n = 144)						
Year	2007	2008	2009	2010	2011*	2012	Diff. 07-12	2007	2008	2009	2010	2011	2012	Diff. 07-12	2007	2008	2009	2010	2011*	2012	Diff. 07-12
No HCV households	20.74%	22.96%	20.00%	16.30%	15.56%	19.26%	-1.48	22.22%	22.22%	44.44%	22.22%	22.22%	33.33%	+11.11	20.83%	22.92%	21.53%	16.67%	15.97%	20.14%	-0.69
Less than 1 percent	21.48%	21.48%	22.96%	21.48%	26.67%	20.74%	-0.74	44.44%	44.44%	33.33%	55.56%	66.67%	44.44%	+0.00	22.92%	22.92%	23.61%	23.61%	29.17%	22.22%	-0.69
1 to 5 percent	24.44%	22.96%	28.15%	30.37%	34.81%	26.67%	+2.22	33.33%	33.33%	22.22%	22.22%	11.11%	22.22%	-11.11	25.00%	23.61%	27.78%	29.86%	33.33%	26.39%	+1.39
5 to 10 percent	22.96%	21.48%	19.26%	22.96%	20.74%	22.22%	-0.74	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00	21.53%	20.14%	18.06%	21.53%	19.44%	20.83%	-0.69
10 to 20 percent	9.63%	11.11%	9.63%	8.89%	2.22%	11.11%	+1.48	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00	9.03%	10.42%	9.03%	8.33%	2.08%	10.42%	+1.39
Greater than 20 percent	0.74%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.74	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00	0.69%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.69

*Note: HCV data for year 2011 exhibits departures from the norm compared to other year datasets. Upon further reviewing the dataset, I find that several tracts within the city of Charlotte have figures that are much less than other year figures for the same years. In this regard, I am led to believe that this is an issue of under-reporting for some census tracts in Charlotte. The actual figure should be somewhere between year 2010 and 2012 data. However, the data for suburban census tracts appear to be uniform to other years data for the same tracts.

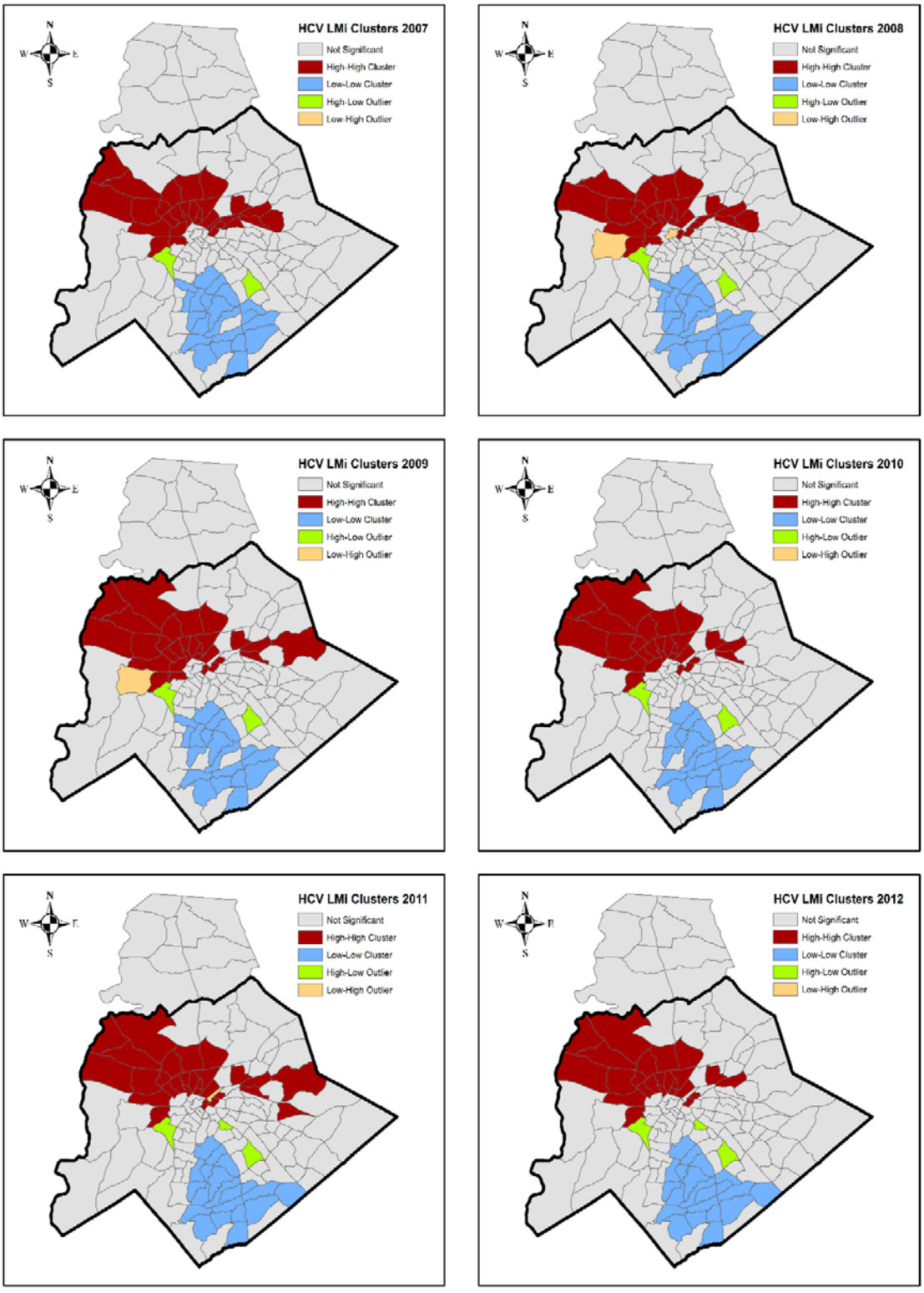

Figure 11. HCV Spatial Clusters in Mecklenburg County (2007~12)

As evidenced in Figure 11, there still exists high concentrations of HCV households, though those concentration levels may not be as extreme as in Cook or Cuyahoga County. As seen in Table 24, based on the Local Moran's I statistics derived from HCV households rates data, HCV households in high-high clusters lived in about 10 percent of all renter-occupied units. This figure was nearly two-times less than the percentage values exhibited in Cook and Cuyahoga County's high concentration clusters. In terms of location, high-high clusters of HCV households are found in the northwest parts of the city of Charlotte, with a few clusters locating on the northeast side of the city. Low-low clusters are predictably found in the central southern area of Mecklenburg County.

Table 24. Comparison of HCV Clusters in Mecklenburg County (2007~12)

Item	HCVs as a Pct% of Renter-Occupied Units						Foreclosure Sales as a Pct% of Mortgaged Units					
Year	2007	2008	2009	2010	2011*	2012	2006	2007	2008	2009	2010	2011
Local Moran's I - High-High Clusters	10.29%	10.18%	9.35%	9.72%	6.97%	10.63%	4.75%	4.08%	2.94%	5.87%	9.59%	2.96%
Local Moran's I - Low-Low Clusters	0.13%	0.12%	0.07%	0.16%	0.18%	0.21%	0.38%	0.33%	0.28%	1.34%	2.30%	0.59%
Mecklenburg County Averages	3.34%	3.42%	3.21%	3.45%	2.54%	3.57%	2.09%	1.96%	1.50%	3.28%	5.81%	1.80%

*Note: HCV data for year 2011 exhibits departures from the norm compared to other year datasets. Upon further reviewing the dataset, I find that several tracts within the city of Charlotte have figures that are much less than other year figures for the same years. In this regard, I am led to believe that this is an issue of under-reporting for some census tracts in Charlotte. The actual figure should be somewhere between year 2010 and 2012 data. However, the data for suburban census tracts appear to be uniform to other years data for the same tracts.

5.1.4. Summary of Findings

Analysis of Cook County shows that the evidence is mixed as to whether HCV households in the county are more spatially distributed after the surge in elevated levels of foreclosures seen in the study years 2008 through 2010. There is clear evidence that

HCV households are increasingly gaining inroads into neighborhoods that previously have not had any HCV households or had low concentrations of these households. However, offsetting this promising trend is the countering evidence that exhibit high concentrations and clusters of HCV households in relatively the same spatial areas, where the share of tracts exhibiting such patterns are increasing over the study years.

Though Cook County analysis partially fails to prove the hypothesis correct, the analysis and data results of Cuyahoga County seem to validate the claims made with this hypothesis. After total foreclosure sales reached a peak figure in 2007, there has been a clear trend where a gradual share of HCV households departed from the city of Cleveland into the suburban areas of Cuyahoga County. Also, similar to Cook County, HCV households in Cuyahoga County have dispersed into more census tracts which previously didn't have HCV households or had very low HCV presence. However, it appears many HCV households were not able to move too far beyond city boundaries. As a result, though within-city HCV share concentration levels were found to be declining after the peak foreclosure sales year of 2007, a new spatial concentration of HCV households has emerged in the adjacent inner-ring suburbs to the east of the city of Cleveland boundaries.

Table 25. Summary & Comparison of Hypothesis 1 Testing Results

Hypothesis 1: Overall, on net, the distribution of HCV residencies after the foreclosure crisis was more spatially distributed than prior to the surge in foreclosures.							
County Name	Peak Foreclosure Sales Year(s)	HCV Distribution Check					Summary Description
		Dispersal - %Tract Presence			Concentration & Clusters		
		2007	2012	change	Location	Static?	
Cook County	2008~2010	86.04%	89.88%	+3.84	southern parts of city and county	Static	Some HCV dispersal identified, however high HCV concentration tracts persist
Cuyahoga County	2007	84.43%	89.22%	+4.79	northeast and southeast parts of city and county	Static & New	Clear identification of HCV dispersal into suburbs, however new high HCV cluster tracts forming in inner-ring suburbs
Mecklenburg County	2009~2010	79.17%	79.86%	+0.69	northwest and central north of city	Static	HCV dispersal not very clear, though HCV cluster tracts exhibit lower levels of concentration compared to other study counties

Finally, it is difficult to fully verify the hypothesis for Mecklenburg County given that its primary city essentially overlaps its boundaries and the available tract data only covers the county itself. The lack of suburban data extending into other surrounding counties (i.e., the greater Charlotte metropolitan area) limits the analysis to a within-city analysis. In regard to the spatial distribution of HCV households within the city of Charlotte, the distribution appears to have been relatively static throughout the study duration. Though foreclosure sales substantially increased in the years 2009 and 2010 (which suggests a severely depressed economic climate), the distribution share of HCV households held remarkably similar to other study years. There is evidence of spatial clustering of HCV households around the northwest parts of Charlotte, however it is also found that these clustered areas exhibit much lower HCV concentration levels compared to the other study counties.

5.2. Hypothesis Testing 2

5.2.1. Cook County Results

5.2.1.1. Distribution of HCV Households by Rate of Poverty

Figure 12 presents the spatial distribution of poverty rates in Cook County for the study duration of 2007 through 2012. The spatial patterns are similar to the foreclosure sales rate patterns found in Figure 3, where concentrations of higher levels of poverty are found primarily in two clusters within the city of Chicago. The similar spatial patterns should be obvious as areas with higher foreclosure rates usually imply that households in the same area had insufficient income to maintain their homes. Beyond the dense concentration of higher levels of poverty in the central city, elevated levels of poverty can be found in patches across the entire county. Also, though the city poverty concentration is similar to the spatial patterns of HCV households found in Figure 4, the spatial relationship across the entire county is not readily identifiable.

Table 26 provides a more in-depth analysis of the relationship between tract poverty rates and the distribution of HCV households. The evidence is somewhat disheartening. While there was a decrease in the share of HCV households in tracts with under 30 percent poverty rates, there was also a large increase in the share of HCV households in tracts with over 30 percent poverty rates.

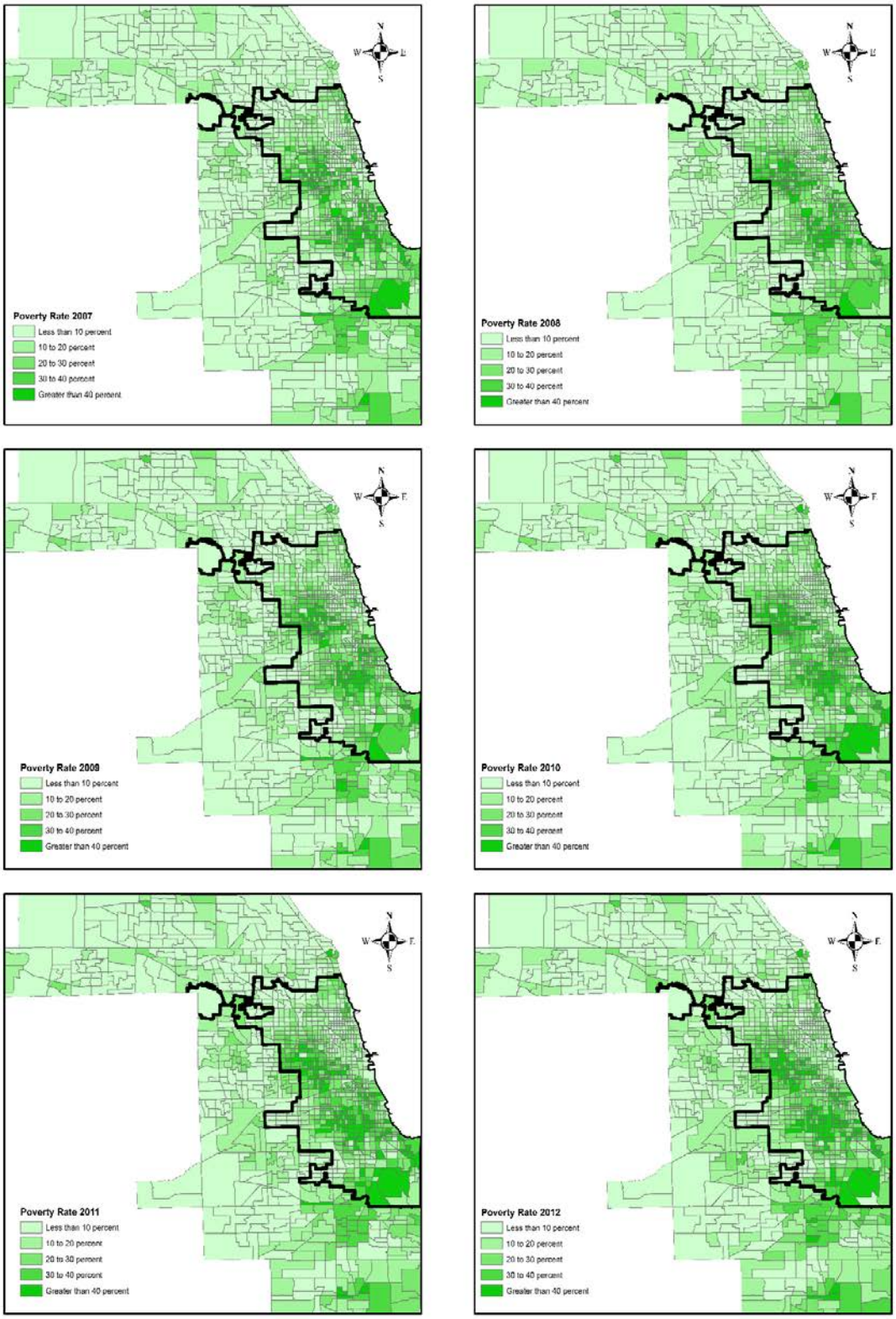

Figure 12. Spatial Distribution of Poverty in Cook County (2007~12)

Table 26. Distribution of HCV by Poverty in Tracts in Cook County (2007~12)

Location	City of Chicago (n = 874)							Suburbs (n = 469)							Cook County (Total n = 1,343)						
Year	2007	2008	2009	2010*	2011	2012	Diff. 07-12	2007	2008	2009	2010	2011	2012	Diff. 07-12	2007	2008	2009	2010*	2011	2012	Diff. 07-12
Less than 10 percent	3.74%	4.92%	5.00%	5.10%	5.62%	4.06%	+0.32	34.43%	30.18%	28.69%	26.64%	23.85%	18.79%	-15.64	12.36%	12.00%	11.51%	12.70%	10.72%	8.10%	-4.26
10 to 20 percent	21.07%	19.27%	16.82%	15.94%	12.49%	12.94%	-8.12	42.72%	48.03%	43.52%	41.57%	43.69%	42.98%	+0.26	27.15%	27.33%	24.16%	24.98%	21.22%	21.19%	-5.96
20 to 30 percent	29.22%	29.36%	28.97%	26.49%	24.61%	26.36%	-2.86	13.87%	13.54%	17.64%	19.45%	18.11%	20.00%	+6.13	24.91%	24.93%	25.85%	24.01%	22.79%	24.61%	-0.29
30 to 40 percent	20.99%	26.19%	28.50%	27.89%	26.03%	24.18%	+3.19	7.91%	7.75%	7.75%	10.58%	12.57%	15.66%	+7.74	17.32%	21.02%	22.80%	21.79%	22.27%	21.84%	+4.52
Greater than 40 percent	24.98%	20.25%	20.71%	24.57%	31.25%	32.46%	+7.48	1.08%	0.50%	2.40%	1.75%	1.78%	2.57%	+1.50	18.26%	14.71%	15.68%	16.52%	23.01%	24.25%	+5.99

*Note: HCV data for year 2010 exhibits departures from the norm compared to other year datasets. Upon further reviewing the dataset, I find that several tracts within the city of Chicago have figures that are much less than other year figures for the same years. In this regard, I am led to believe that this is an issue of under-reporting for some census tracts in Chicago. However, the data for suburban census tracts appear to be uniform to other years data for the same tracts.

Table 27. Distribution of HCV by %Black in Tracts in Cook County (2007~12)

Location	City of Chicago (n = 874)							Suburbs (n = 469)							Cook County (Total n = 1,343)						
Year	2007	2008	2009	2010*	2011	2012	Diff. 07-12	2007	2008	2009	2010	2011	2012	Diff. 07-12	2007	2008	2009	2010*	2011	2012	Diff. 07-12
Less than 10 percent	11.51%	11.23%	11.23%	12.80%	12.02%	12.22%	+0.71	26.98%	28.01%	27.30%	26.90%	26.27%	24.50%	-2.49	15.86%	15.93%	15.65%	17.78%	16.00%	15.59%	-0.27
10 to 25 percent	7.89%	7.23%	6.96%	6.74%	6.88%	5.95%	-1.93	7.88%	6.52%	7.76%	6.99%	7.40%	9.31%	1.42	7.88%	7.03%	7.18%	6.83%	7.02%	6.87%	-1.01
25 to 50 percent	4.75%	5.13%	5.97%	6.16%	5.34%	5.87%	+1.12	15.29%	16.02%	14.55%	15.53%	13.69%	13.13%	-2.16	7.71%	8.18%	8.33%	9.47%	7.68%	7.86%	0.15
50 to 75 percent	6.10%	6.30%	5.47%	8.10%	8.81%	8.22%	+2.12	19.85%	19.44%	17.07%	21.49%	19.43%	20.87%	1.01	9.96%	9.98%	8.66%	12.82%	11.78%	11.69%	+1.73
Greater than 75 percent	69.76%	70.12%	70.36%	66.20%	66.96%	67.74%	-2.02	30.00%	30.01%	33.33%	29.08%	33.21%	32.21%	+2.21	58.58%	58.88%	60.18%	53.11%	57.52%	57.98%	-0.60

*Note: HCV data for year 2010 exhibits departures from the norm compared to other year datasets. Upon further reviewing the dataset, I find that several tracts within the city of Chicago have figures that are much less than other year figures for the same years. In this regard, I am led to believe that this is an issue of under-reporting for some census tracts in Chicago. However, the data for suburban census tracts appear to be uniform to other years data for the same tracts.

The share of HCV households living in areas with greater than 40 percent poverty rates has increased by nearly 6 percentage points from 18.26 percent in 2007 to 24.25 percent in 2012 in the county. The city of Chicago primarily contributes to this increase, where the share of HCV households living in greater than 40 percent poverty tracts increased by over 7 percentage points from 24.98 percent in 2007 to 32.46 percent in 2012. Though on average, HCV households residing in the suburbs lived in lower poverty tracts compared to HCV households in the central city, the share of households living in tracts with under 10 percent poverty rates astonishingly decreased by over 15 percentage points from 2007 to 2012. Conversely, every other poverty rate threshold showed increasing shares of residing HCV households in the suburbs, with nearly an 8 percentage point increase in the share of HCV households residing in tracts with 30 to 40 percent poverty rates.

5.2.1.2. Distribution of HCV Households by Percentage of African-Americans

Figure 13 shows that African-American populations are primarily concentrated in the southern part of Chicago and extends into the southern part of Cook County. The spatial patterns more or less overlap with the spatial distribution of housing vouchers in Figure 4, which suggest that in areas with higher concentrations of HCV households, those households are predominantly African-American households. Table 27 further verifies this assertion, where roughly 60 percent of all HCV households reside in tracts with over 75 percent African-American populations in the county. The central city share is somewhat higher, where a range of 66 to 70 percent of all HCV households in the city reside in tracts with over 75 percent African-American populations.

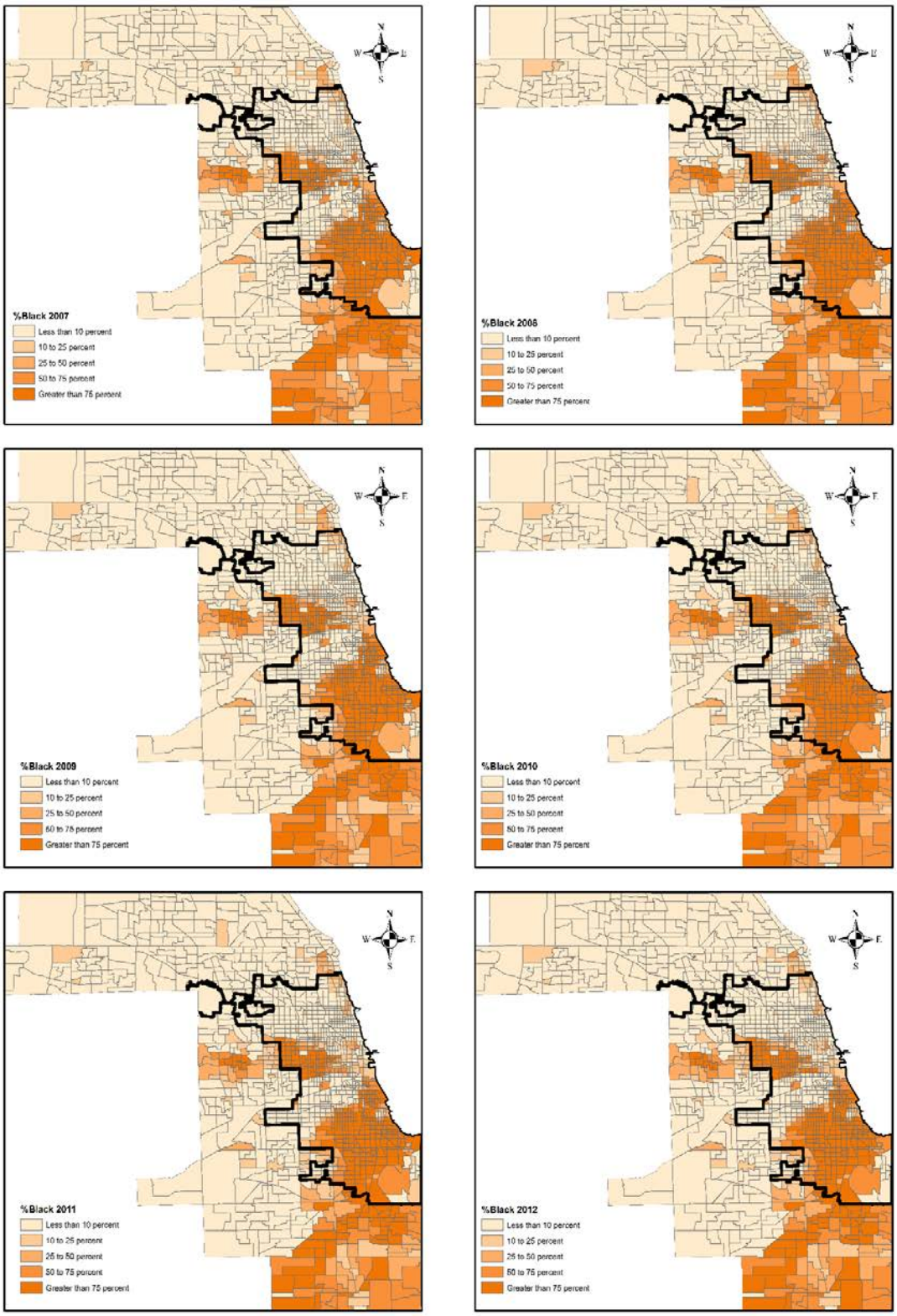

Figure 13. Spatial Distribution of %Black in Cook County (2007~12)

5.2.2. Cuyahoga County Results

5.2.2.1. Distribution of HCV Households by Rate of Poverty

Figure 14 presents the spatial distribution of poverty rates in Cuyahoga County for the study duration of 2007 through 2012. The spatial patterns are similar to the foreclosure sales rate patterns found in Figure 6, where concentrations of higher levels of poverty are found primarily in the eastern parts within the city of Cleveland. However, elevated levels of poverty appear to be confined mostly to the city, with decreasing amounts of poverty found in tracts further away from city boundaries. Also, though the city poverty concentration is similar to the spatial patterns of HCV households found in Figure 7, HCV clusters found in the inner-ring suburbs appear to exhibit much lower poverty rates compared to the clusters found within the city of Cleveland.

Table 28 provides a more in-depth analysis of the relationship between tract poverty rates and the distribution of HCV households. As was the case with Cook County, the evidence of poverty in the city of Cleveland is quite disheartening. While there has been a clear decrease in the share of HCV households in tracts with under 20 percent poverty rates, the share of households residing in tracts with over 40 percent poverty rates increased by nearly 18 percentage points from 2007 to 2012, with over 44 percent of all Cleveland HCV households residing in such extreme poverty tracts. However it does appear that suburban HCV households comparatively live in tracts with lower poverty rates than HCV households residing in the city of Cleveland.

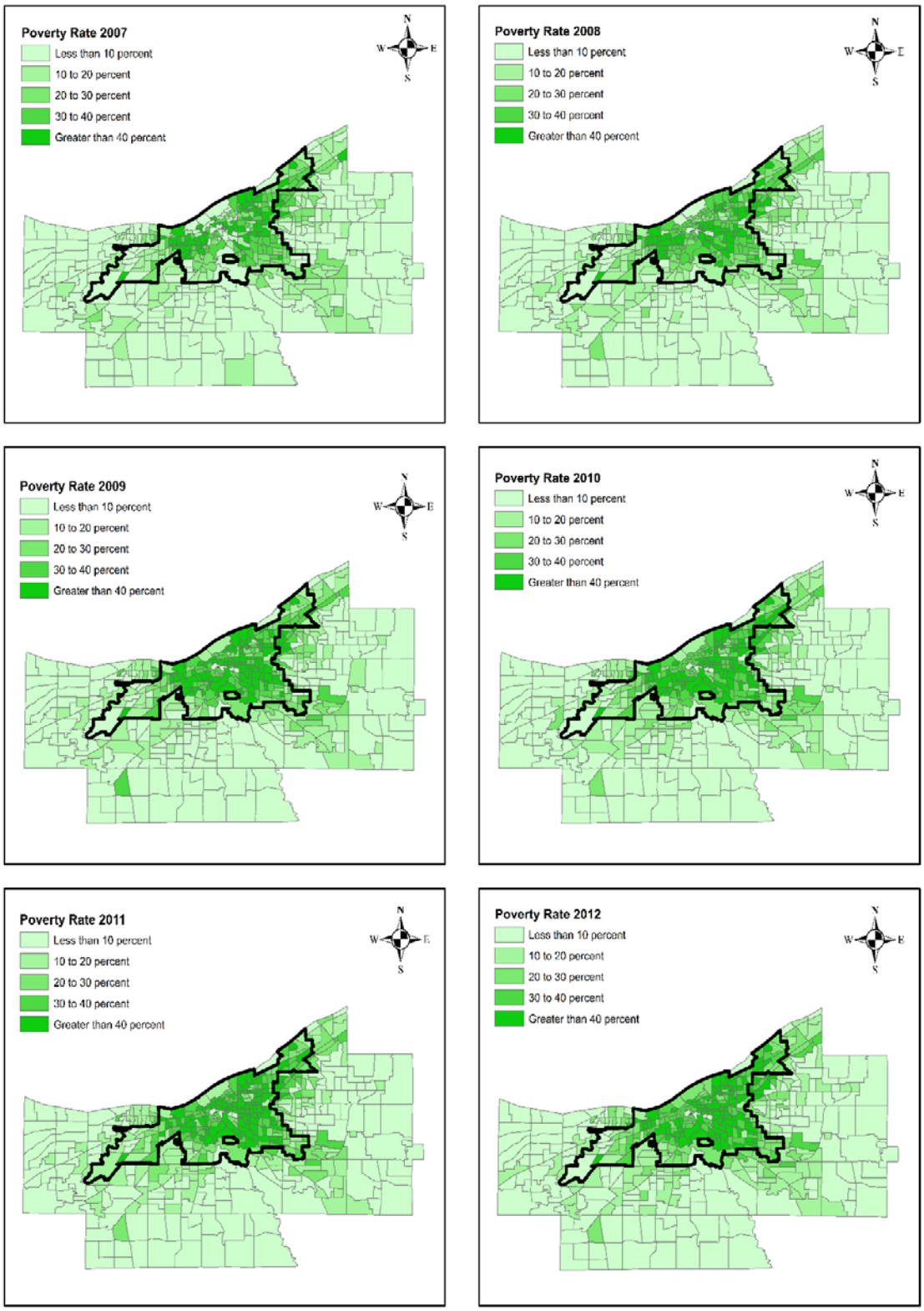

Figure 14. Spatial Distribution of Poverty in Cuyahoga County (2007~12)

Table 28. Distribution of HCV by Poverty in Tracts in Cuyahoga County (2007~12)

Location	City of Cleveland (n = 225)							Suburbs (n = 276)							Cuyahoga County (Total n = 501)						
Year	2007	2008	2009	2010	2011	2012	Diff. 07-12	2007	2008	2009	2010	2011	2012	Diff. 07-12	2007	2008	2009	2010	2011	2012	Diff. 07-12
Less than 10 percent	3.60%	1.79%	2.33%	0.55%	0.38%	0.50%	-3.10	21.90%	19.69%	17.13%	15.63%	15.65%	14.33%	-7.57	11.79%	9.99%	9.44%	8.12%	8.21%	7.67%	-4.12
10 to 20 percent	14.18%	12.37%	10.48%	8.53%	8.10%	3.25%	-10.93	38.04%	32.94%	40.10%	42.22%	38.81%	40.15%	+2.12	24.85%	21.80%	24.71%	25.43%	23.85%	22.38%	-2.47
20 to 30 percent	22.48%	24.43%	19.64%	21.92%	21.32%	24.09%	+1.60	18.80%	25.56%	16.82%	19.15%	20.60%	20.59%	+1.78	20.84%	24.95%	18.28%	20.53%	20.95%	22.27%	+1.43
30 to 40 percent	33.39%	34.69%	32.35%	29.15%	28.72%	27.83%	-5.55	7.32%	16.29%	13.19%	13.37%	20.48%	17.94%	+10.61	21.72%	26.26%	23.14%	21.23%	24.49%	22.70%	+0.98
Greater than 40 percent	26.36%	26.72%	35.20%	39.86%	41.48%	44.33%	+17.98	13.93%	5.52%	12.77%	9.62%	4.46%	7.00%	-6.94	20.80%	17.00%	24.42%	24.69%	22.49%	24.97%	+4.18

Table 29. Distribution of HCV by %Black in Tracts in Cuyahoga County (2007~12)

Location	City of Cleveland (n = 225)							Suburbs (n = 276)							Cuyahoga County (Total n = 501)						
Year	2007	2008	2009	2010	2011	2012	Diff. 07-12	2007	2008	2009	2010	2011	2012	Diff. 07-12	2007	2008	2009	2010	2011	2012	Diff. 07-12
Less than 10 percent	5.58%	3.69%	3.03%	2.03%	2.97%	3.57%	-2.01	17.25%	16.69%	14.32%	15.00%	13.32%	12.58%	-4.67	10.81%	9.65%	8.45%	8.53%	8.28%	8.24%	-2.56
10 to 25 percent	15.24%	18.34%	15.14%	16.49%	16.58%	13.75%	-1.49	7.54%	6.83%	7.97%	4.92%	6.63%	6.61%	-0.94	11.80%	13.06%	11.69%	10.68%	11.48%	10.05%	-1.75
25 to 50 percent	11.19%	11.02%	16.06%	16.79%	16.18%	17.69%	+6.50	20.25%	13.38%	12.15%	14.62%	16.13%	13.28%	-6.98	15.24%	12.10%	14.18%	15.70%	16.15%	15.40%	+0.16
50 to 75 percent	10.38%	9.87%	9.65%	10.80%	8.30%	9.97%	-0.41	15.88%	25.21%	26.12%	29.52%	27.79%	33.09%	+17.21	12.84%	16.90%	17.56%	20.20%	18.30%	21.96%	+9.12
Greater than 75 percent	57.61%	57.08%	56.12%	53.89%	55.97%	55.02%	-2.60	39.07%	37.89%	39.44%	35.94%	36.13%	34.44%	-4.63	49.32%	48.28%	48.11%	44.88%	45.79%	44.35%	-4.97

In the suburbs, the share of HCV households residing in extreme poverty tracts decreased by nearly 7 percentage points to a 7 percent share of all suburban HCV households. Also, roughly 40 percent of all suburban HCV households reside in tracts with between 10 to 20 percent poverty rates. However, contrary to these positive findings, the share of suburban HCV households residing in tracts with less than 10 percent poverty decreased by over 7 percentage points from 2007 to 2012, while the share of households in tracts with 30 to 40 percent poverty increased by over 10 percentage points in the same time-frame. Overall, from the county total perspective, the share of HCV households residing in tracts with less than 20 percent poverty has declined during the study years, while households in tracts with more than 20 percent poverty has gradually increased over the same study period.

5.2.2.2. Distribution of HCV Households by Percentage of African-Americans

Figure 15 shows that African-American populations are primarily concentrated in the eastern part of the city of Cleveland and extends further into the northeast and southeast parts of Cuyahoga County. The spatial patterns more or less overlap with the spatial distribution of housing vouchers in Figure 7, which suggest that in areas with higher concentrations of HCV households, those households are predominantly African-American households. Table 29 further verifies this assertion, where roughly 55 percent of all HCV households in Cleveland reside in tracts with over 75 percent African-American populations. In the suburbs, roughly two-thirds of all suburban HCV households reside in tracts with over 50 percent African-American populations.

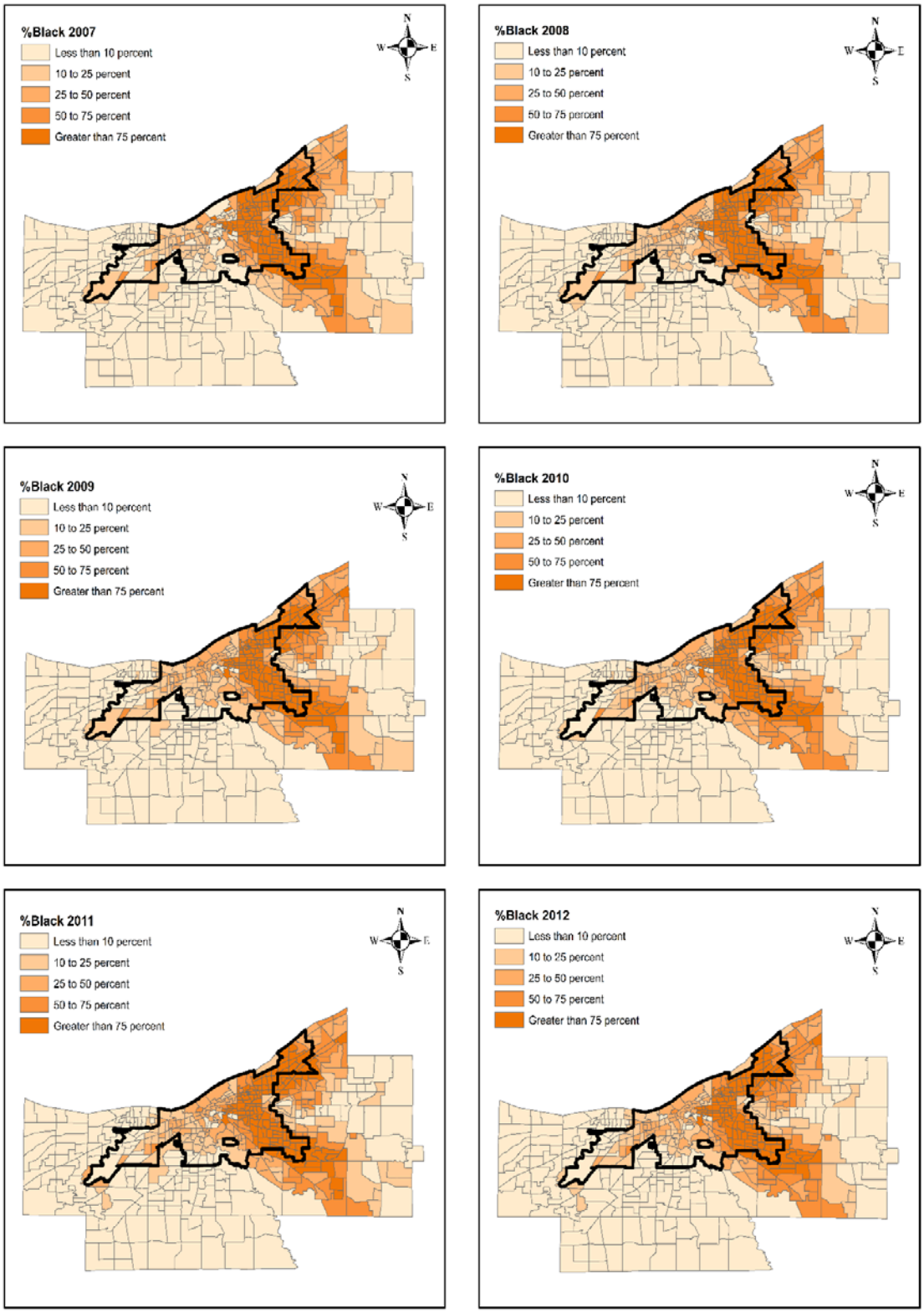

Figure 15. Spatial Distribution of %Black in Cuyahoga County (2007~12)

5.2.3. Mecklenburg County Results

5.2.3.1. Distribution of HCV Households by Rate of Poverty

Figure 16 presents the spatial distribution of poverty rates in Mecklenburg County for the study duration of 2007 through 2012. The spatial patterns are similar to the foreclosure sales rate and HCV household rate patterns found in Figure 9 and 10, where concentrations of higher levels of poverty are found primarily as a crescent around the northern parts of the city of Charlotte adjacent to the city's downtown area. Census tracts further south from downtown Charlotte and tracts in the county but outside of Charlotte exhibit relatively low poverty rates.

Table 30 provides a more in-depth analysis of the relationship between tract poverty rates and the distribution of HCV households. Overall, the evidence is discouraging. While there has been a gradual decrease in the share of HCV households in tracts with under 30 percent poverty rates, a large increase is witnessed in the share of HCV households in tracts with over 30 percent poverty rates in the county. In particular, the share of HCV households in tracts with 30 to 40 percent poverty increased by 20 percentage points, resulting in a 27 percent share in 2012. Conversely, the share of HCV households in tracts with 10 to 20 percent poverty decreased by over 14 percentage points during the same time-frame. However, though there also has been an increase in the share of HCV households in tracts with extreme poverty levels (i.e., over 40 percent poverty), households in these tracts only represent 12 percent of all HCV households in Mecklenburg County.

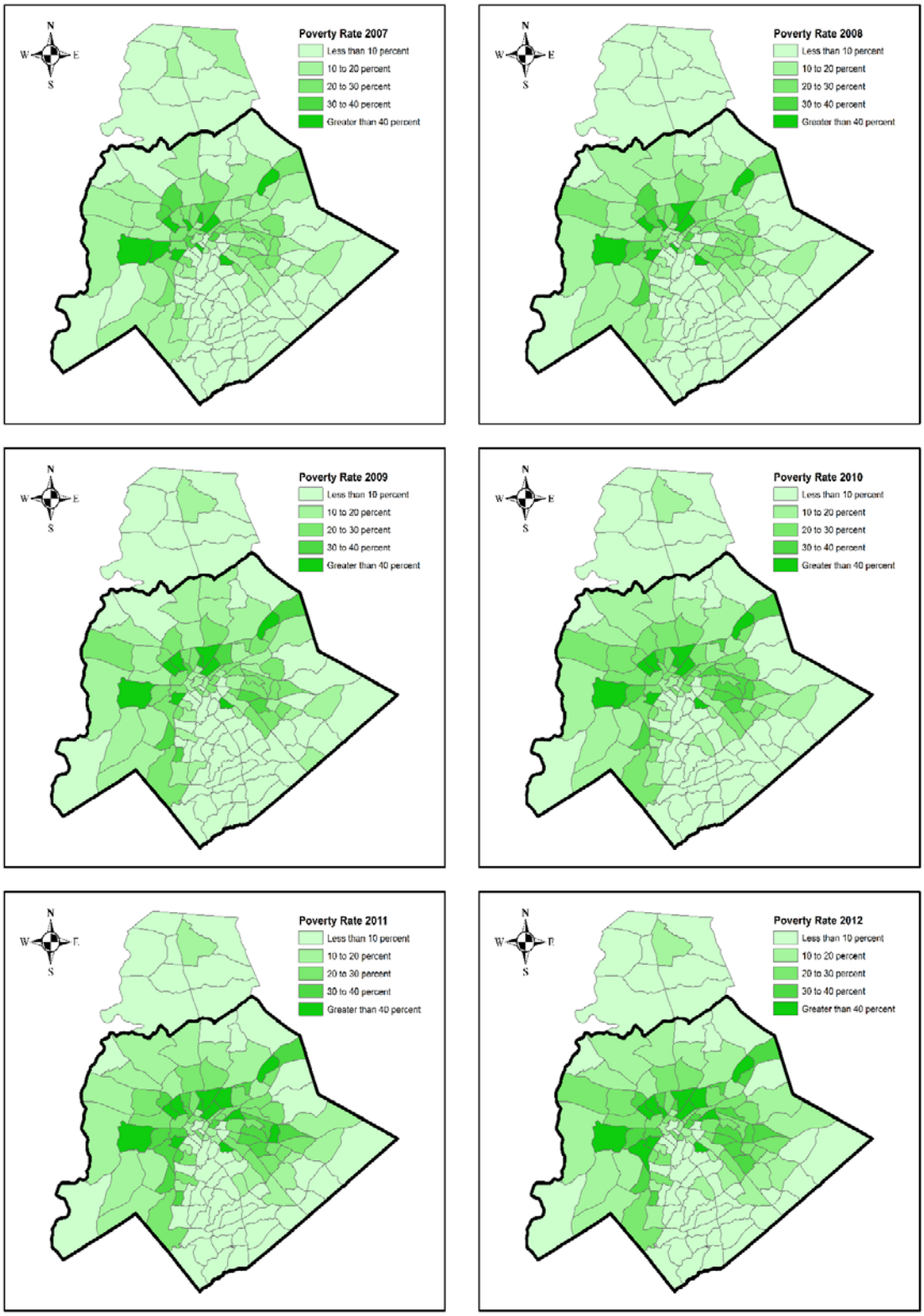

Figure 16. Spatial Distribution of Poverty in Mecklenburg County (2007~12)

Table 30. Distribution of HCV by Poverty in Tracts in Mecklenburg Cnty (07~12)

Location	City of Charlotte (n = 135)							Suburbs (n = 9)							Mecklenburg County (Total n = 144)						
Year	2007	2008	2009	2010	2011*	2012	Diff. 07-12	2007	2008	2009	2010	2011	2012	Diff. 07-12	2007	2008	2009	2010	2011*	2012	Diff. 07-12
Less than 10 percent	12.82%	9.53%	12.87%	9.74%	10.22%	7.04%	-5.77	75.00%	100.00%	92.11%	97.44%	96.30%	91.67%	16.67	13.50%	10.56%	13.56%	10.44%	10.84%	7.78%	-5.72
10 to 20 percent	34.90%	36.79%	30.76%	23.69%	20.49%	20.78%	-14.12	25.00%	0.00%	7.89%	2.56%	3.70%	8.33%	-16.67	34.79%	36.38%	30.56%	23.52%	20.37%	20.67%	-14.12
20 to 30 percent	35.85%	36.07%	40.10%	43.49%	34.38%	32.76%	-3.09	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00	35.46%	35.66%	39.75%	43.14%	34.13%	32.47%	-2.99
30 to 40 percent	7.14%	10.36%	7.65%	15.25%	25.44%	27.22%	+20.08	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00	7.06%	10.24%	7.58%	15.12%	25.26%	26.98%	+19.92
Greater than 40 percent	9.29%	7.25%	8.62%	7.83%	9.47%	12.19%	+2.90	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00	9.19%	7.16%	8.55%	7.77%	9.40%	12.09%	+2.90

*Note: HCV data for year 2011 exhibits departures from the norm compared to other year datasets. Upon further reviewing the dataset, I find that several tracts within the city of Charlotte have figures that are much less than other year figures for the same years. In this regard, I am led to believe that this is an issue of under-reporting for some census tracts in Charlotte. The actual figure should be somewhere between year 2010 and 2012 data. However, the data for suburban census tracts appear to be uniform to other years data for the same tracts.

Table 31. Distribution of HCV by %Black in Tracts in Mecklenburg Cnty (07~12)

Location	City of Charlotte (n = 135)							Suburbs (n = 9)							Mecklenburg County (Total n = 144)						
Year	2007	2008	2009	2010	2011*	2012	Diff. 07-12	2007	2008	2009	2010	2011	2012	Diff. 07-12	2007	2008	2009	2010	2011*	2012	Diff. 07-12
Less than 10 percent	2.22%	1.13%	1.11%	1.65%	2.27%	1.43%	-0.79	83.33%	50.98%	60.53%	53.85%	44.44%	56.25%	-27.08	3.12%	1.70%	1.63%	2.06%	2.58%	1.91%	-1.20
10 to 25 percent	6.26%	5.21%	3.19%	3.19%	3.18%	2.91%	-3.35	16.67%	49.02%	39.47%	46.15%	55.56%	43.75%	+27.08	6.37%	5.71%	3.51%	3.54%	3.56%	3.26%	-3.11
25 to 50 percent	33.56%	35.24%	39.66%	43.63%	44.44%	49.22%	+15.66	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00	33.19%	34.84%	39.31%	43.29%	44.12%	48.79%	+15.60
50 to 75 percent	34.14%	31.53%	32.29%	28.20%	29.99%	23.74%	-10.39	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00	33.76%	31.18%	32.00%	27.98%	29.77%	23.54%	-10.22
Greater than 75 percent	23.82%	26.88%	23.76%	23.32%	20.12%	22.70%	-1.13	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00	23.56%	26.58%	23.55%	23.14%	19.97%	22.50%	-1.06

*Note: HCV data for year 2011 exhibits departures from the norm compared to other year datasets. Upon further reviewing the dataset, I find that several tracts within the city of Charlotte have figures that are much less than other year figures for the same years. In this regard, I am led to believe that this is an issue of under-reporting for some census tracts in Charlotte. The actual figure should be somewhere between year 2010 and 2012 data. However, the data for suburban census tracts appear to be uniform to other years data for the same tracts.

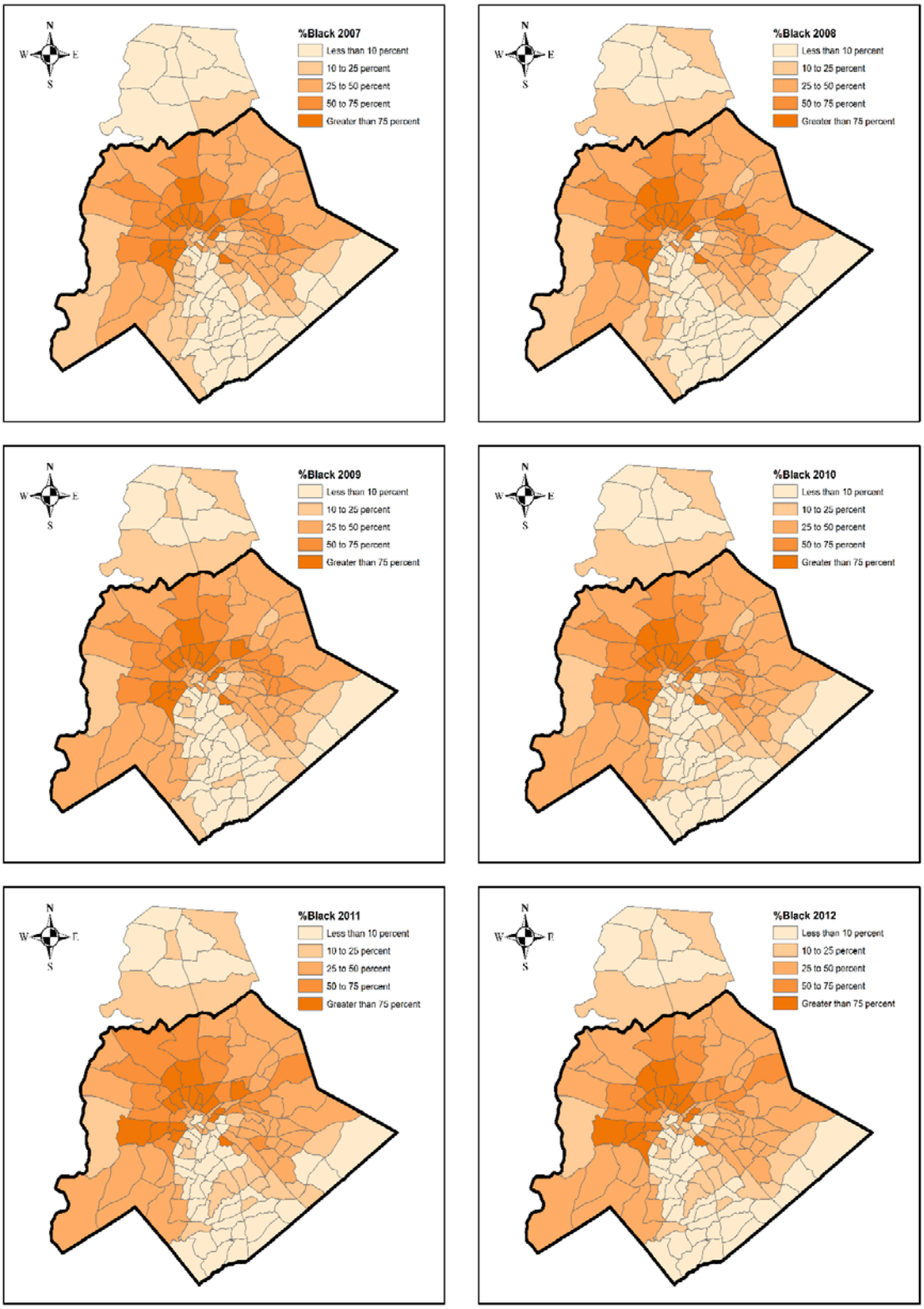

Figure 17. Spatial Distribution of %Black in Mecklenburg County (2007~12)

5.2.3.2. Distribution of HCV Households by Percentage of African-Americans

Figure 17 shows that tracts with the highest African-American population concentrations are primarily found in the immediate northern and western parts of downtown Charlotte. The crescent pattern of high African-American concentrations are similar to the spatial patterns of HCV households, which once again suggests that HCV households in these areas have a high likelihood of being an African-American household. Table 31 further verifies this assertion, where roughly 95 percent of all HCV households reside in tracts with over 25 percent African-American populations in the county. However, there appears to be a clear trend where HCV households are increasingly locating in less African-American concentrated tracts. From 2007 to 2012, the share of HCV households in tracts with 25 to 50 percent African-American populations increased by over 15 percentage points to a 48.79 percent share in 2012. Conversely, the share of HCV households in tracts with 50 to 75 percent African-American populations decreased by over 10 percentage points in the same time-frame, while share of households in tracts with over 75 percent African-American populations slightly decreased as well.

5.2.4. Summary of Findings

This analysis of the three study counties have not supported the hypothesis that the distribution of HCV households became less concentrated in high poverty tracts after the foreclosure crisis. Quite the contrary, all three counties exhibit an increasing share in the amount of HCV households residing in these extreme poverty tracts (over 40 percent poverty), as well as other tracts with comparably elevated levels of poverty. In Cook

County, while tracts with under 30 percent poverty rates decreased across the county, tracts with over 30 percent poverty rates show steady increases throughout the study duration. In Cuyahoga County, over two-thirds of all HCV households reside in tracts with over 20 percent poverty rates with the share percentage gradually increasing from 2007 to 2012. Though the share of HCV households that live in tracts with extreme poverty is comparably low in Mecklenburg County, that share has nonetheless steadily increased throughout the study duration.

Table 32. Summary & Comparison of Hypothesis 2 Testing Results

Hypothesis 2: Overall, on net, the distribution of HCV residencies after the foreclosure crisis was less concentrated in high poverty (i.e., poverty rates of over 40 percent) tracts.									
County Name	**Peak Foreclosure Sales Year(s)**	**HCV Distribution Check**							
		Extreme Poverty Tracts Share (> 40%)				**Extreme %Black Tracts Share (> 75%)**			
		2007	**2012**	**Change**	**Primary Locations**	**2007**	**2012**	**Change**	**Primary Locations**
Cook County	2008~2010	18.26%	24.25%	+5.99	two large clusters in central and south side of Chicago	58.58%	57.98%	-0.60	southern part of Chicago and southern part of county below Chicago
Cuyahoga County	2007	20.80%	24.97%	+4.18	two large clusters in eastern parts and midwest area of Cleveland	49.32%	44.35%	-4.97	eastern part of Cleveland and northeast and southeast suburbs adjacent to Cleveland
Mecklenburg County	2009~2010	9.19%	12.09%	+2.90	northern crescent adjacent to downtown Charlotte	23.56%	22.50%	-1.06	northern crescent adjacent to downtown Charlotte

Given the analysis on the spatial distribution of African-American populations in the three counties, it appears the share of HCV households that live in extreme poverty tracts relatively coincide spatially with the share of households that live in tracts heavily concentrated by African-American populations (see Table 32). This would further suggest that HCV households located in the poorest neighborhoods are mostly African-American households.

The results of the tests of hypothesis 1 and 2 do not explicitly describe the relationship between foreclosures and HCV household distributions. Rather, the results merely provide important context that during the foreclosure crisis HCV households did not become less spatially concentrated in poor and African-American neighborhoods. In order to determine whether foreclosures had a role in the distribution of HCV households, multivariate analysis is required. To do this, I now turn to testing hypotheses 3 and 4.

5.3. Hypothesis Testing 3

Hypothesis 3 endeavors to prove that foreclosures have a positive increasing effect on HCV residency units. In order to estimate the relationship, a negative binomial regression with the log-link function is applied. The robust covariance matrix estimator is used to control for the presence of heteroscedasticity, while all time-invariant socio-economic control variables were clustered at the tract level to control for serial auto-correlation issues.

5.3.1. Model Results – Cook County, Illinois

5.3.1.1. Descriptive Statistics

To begin, Table 33 shows the basic descriptive statistics for all variables used in the Cook County data analysis. The mean, standard deviation and the ranges of each variable used in the analysis are shown. HCV counts averaged 33.38 per census tract with a range of 0 to 662. Foreclosure sale counts averaged 11.18 per tract with a range of 0 to 328. Overall, it appears the county has a good mix of racial minority ethnicities with

African-Americans, Asians and Latinos comprising 32, 6, and 22 percent of the sample population, respectively. Also, foreign-born residents comprise 18.5 percent of the sample population, respectively.

Table 33. Cook County Descriptive Statistics (Valid N-Pairings = 7,707)

Variables	MIN	MAX	MEAN	SD
hcv (DV)	0.00	662.00	33.38	52.18
fcsales	0.00	328.00	11.18	13.82
tpop	1.74	24304.00	3933.25	2543.87
pctblack	0.00	100.00	31.88	38.72
pctasian	0.00	84.91	5.70	9.03
pctlatino	0.00	98.47	22.14	26.28
pctpubass	0.00	35.84	4.05	4.34
medHHinc	9550.00	236250.00	55722.36	28830.02
pctfemalehh	0.00	100.00	24.20	17.80
pctunemp	0.70	51.00	13.77	8.68
pctmoved	0.00	100.00	25.88	13.64
pctrentocc	0.55	98.50	45.07	23.45
pctforborn	0.00	65.10	18.53	15.23
pcthudfmr	0.00	100.00	47.77	22.58
pctvacancy	0.00	55.10	6.63	6.39
pctpoverty	0.25	74.01	19.52	14.31
medhsage	0.03	230.00	57.80	28.02
pctd1unit	0.00	100.00	17.81	22.57
central	0.00	1.00	0.65	0.48

Among additional socio-economic variables none of the mean values appear to be over-pronounced. It does appear there is some residential instability, in that renter-occupied units comprise about 45 percent of the sample, where nearly 26 percent of residents in these units have moved in the past year. Rental vacancy rate seems to be

quite low at 6.6 percent, though nearly half (47.8 percent) of the rental housing stock is priced below (or at) the FMR for the county. The median age of housing units is also quite high at 57.8 years since built. Though each of the mean values of these various socio-economic and housing characteristics appear average overall, the wide value ranges of each variable and the fact that nearly two-thirds of the sample tracts are in the City of Chicago suggest that there may be a stark contrast of characteristic values among individual census tracts.

Returning to the two primary variables of interest, Table 34 shows average tract counts for HCV and foreclosure sales by year. In general, the mean of HCV counts have steadily increased over the study duration, though there appears to be a slight dip in 2010.[14] The mean of foreclosure sales counts have increased over three-folds from 2006 to 2009, but then have somewhat decreased afterwards, although still at much higher values than pre-2007.

Table 35 shows the mean HCV count by the number of foreclosure sales in ascending order. The table shows that mean HCV count in a census tract steadily increases in general, as the number of foreclosures increase. For example, the mean HCV count per census tract in tracts with zero foreclosures was four times less than tracts with seven foreclosures, and nearly six times less than tracts with 14 foreclosures. Figure 18 provides visual illustration of this relationship. There appears to be a positive linear relationship between the two variables, though the relationship becomes less obvious at

[14] I suspect that there was more "under-reporting" for this year compared to other years in the dataset, however as seen by the total count of valid observations, it may be more a case of under-reporting within a tract rather than the entire tract missing values. It is near impossible to correct for under-reporting within a tract, since in many cases there is no uniform relationship among annual total values.

higher counts of foreclosures. Obviously, Table 35 is merely a cross-examination of the two variables with basic descriptive statistics and therefore is not sufficient to make a substantive inferential statement, however this preliminary test does show evidence that there may indeed be a relationship between HCV and foreclosure sales as theorized in this dissertation.

Table 34. Total HCV & Foreclosure Sales by Year in Cook County

	Valid N	MIN	MAX	Mean	Std. Dev.
hcv					
2006	1343	0	507	31.60	48.93
2007	1343	0	518	33.24	51.24
2008	1343	0	536	34.58	53.17
2009	1343	0	529	35.04	53.20
2010	1338	0	501	27.31	43.02
2011	1342	0	662	36.30	58.95
fcsales					
2006	1313	0	86	4.77	8.06
2007	1313	0	114	8.24	11.07
2008	1313	0	131	12.94	14.23
2009	1313	0	427	15.73	19.34
2010	1313	0	328	15.30	17.24
2011	1313	0	214	11.97	13.32

Table 35. Mean HCV Count by Foreclosure Sales in Cook County

No.# of FCSales	Observations	Mean HCV Count
0	878	7.57
1	700	11.99
2	542	13.83
3	489	17.56
4	414	19.83
5	394	22.68
6	360	25.02
7	313	29.63
8	301	27.58
9	270	30.76
10	209	32.91
11	226	39.52
12	195	39.53
13	183	36.49
14	163	40.01
15 or more	2234	65.21
TOTAL	7871	

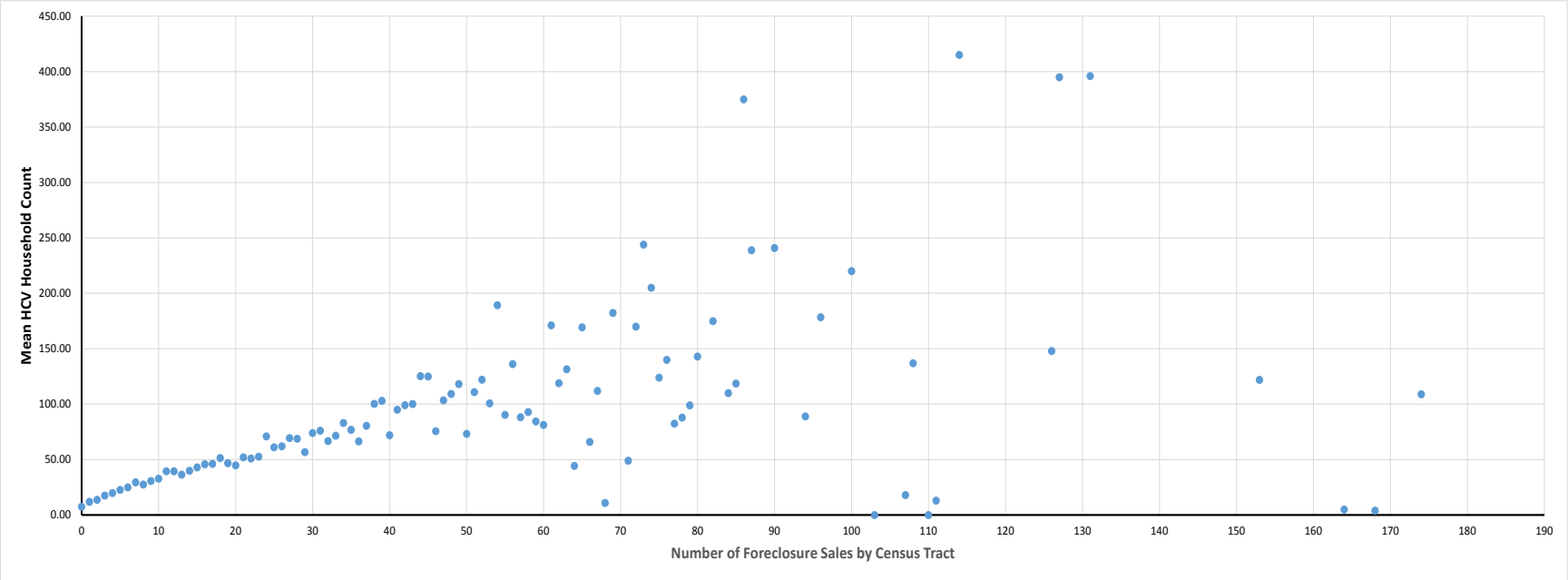

Figure 18. Mean HCV Count by Foreclosure Sales in Tracts in Cook County

5.3.1.2. Regression Results

Table 36 shows the results of the negative binomial regression model with all previously specified variables included. Also, as stated in the methodology chapter, the model controls for heteroscedasticity and serial auto-correlation. Collinearity diagnostic tests suggest that multicollinearity should not be an issue as none of the variables have a variance inflation factor exceeding 10, nor a tolerance value below 0.10.[15]

The model Wald ratio chi-square test figure of 2688.21, $p < 0.01$, indicates that the set of predictor variables as a whole are statistically significant. Both current and lagged values of the count of foreclosure sales variable are found to be a statistically significant predictor ($p < 0.01$) of HCV residency counts in a census tract. Holding other variables constant, for every one unit increase in current year and prior year foreclosure sales, the count of HCV residencies is expected to increase by approximately 0.9 and 0.7 percent, respectively.[16] Thus, though the effect magnitude appears to be relatively modest, model results lend credence to the hypothesis that the count of foreclosure sales exhibit a direct positive effect on HCV residency counts.

[15] Collinearity diagnostics were generated through ordinary least squares (OLS) regression as statistical packages offered no recourse to test for collinearity based on the negative binomial regression model. This is considered to be a valid process since multicollinearity is about measuring the quality of the linear combination of predictor variables loaded into a model, and therefore the conceptual components of collinearity diagnostics should not change based on the type of regression model that is being estimated.

[16] Given that a 'log unit' may not be readily understandable, all subsequent continuous and dichotomous independent variables have been interpreted using the incident rate ratio (IRR).

Table 36. NBReg Model Results for Cook County (N = 7,707)

VARIABLE	COEFF[a]	Robust SE[b]	P-Value	IRR
(Intercept)	1.54454***	0.40192	0.000	—
fcsales	0.00879***	0.00201	0.000	1.00883
lag of fcsales	0.00682***	0.00211	0.001	1.00684
total population	0.00020***	0.00002	0.000	1.00020
percent Black	0.02923***	0.00219	0.000	1.02966
percent Asian	0.01258*	0.00669	0.060	1.01266
percent Latino	0.01171***	0.00237	0.000	1.01178
percent public assistance	-0.01607*	0.00930	0.084	0.98406
median HH income	-0.00001***	0.00000	0.003	0.99999
percent female-headed HH	0.00730***	0.00251	0.004	1.00733
pct unemployment	-0.01355***	0.00499	0.007	0.98654
pct renters moved in past yr	-0.00456**	0.00233	0.049	0.99543
pct renter-occupied homes	0.01200***	0.00268	0.000	1.01207
percent foreign-born	-0.00468	0.00510	0.358	0.99533
pct rental units under FMR	-0.00099	0.00239	0.680	0.99901
rental vacancy rate	0.00540	0.00501	0.281	1.00542
percent poverty	-0.01300***	0.00425	0.002	0.98712
median age of housing unit	0.00359**	0.00174	0.039	1.00360
pct detached 1-unit rent homes	-0.00791***	0.00187	0.000	0.99212
City of Chicago, Illinois	-0.51988***	0.09168	0.000	0.59459
Year 2007	-0.00474	0.01511	0.754	0.99527
Year 2008	-0.04618*	0.02503	0.065	0.95487
Year 2009	-0.07788**	0.03658	0.033	0.92507
Year 2010	-0.26516***	0.04533	0.000	0.76708
Year 2011	-0.00084	0.04341	0.985	0.99916
(Negative binomial)[c]	0.81988***	0.04816	—	—
Wald ratio χ^2	2688.21***			

Notes

a. Unstandardized coefficients.

b. SE for foreclosure related variables are not clustered, while all other control variables are clustered at the tract level.

c. This measures the significance of over-dispersion, where an estimate greater than zero suggests over-dispersion.

N = 7707 (Y2006 = 1285, Y2007 = 1285, Y2008 = 1286, Y2009 = 1286, Y2010 = 1281, Y2011 = 1284)

* p < 0.1; ** p < 0.05; *** p < 0.01

Among the additional control variables introduced into the model, many of the variables were found to be statistically significant predictors ($p < 0.05$) of HCV residencies save the percentage of foreign-born residents, percentage of rental units under U.S. HUD's FMR, and the rental vacancy rate. It was somewhat puzzling that the variable of percentage of rental units under HUD's FMR was found to be statistically insignificant, given the fact that voucher holders are predominantly low-income individuals or households, and even with the voucher cannot afford to rent beyond a certain price level. The racial minority variables are shown to have a positive effect on HCV residencies as expected, where a one percentage point increase in African-American, Asian, and Latino populations is expected to increase HCV residency counts by approximately 3.0, 1.3, and 1.2 percent, respectively.

There also appears to be some discrepancy among the variables estimating HCV residency counts. The negative effects of three variables are consistent with prior HCV literature that HCV households are increasingly spreading towards better neighborhoods and are less likely to live in high-poverty neighborhoods (Galvez, 2010; McClure et al., 2015). A one percentage point increase in percentage of families receiving public assistance, percentage unemployed, and percentage living below federally-defined poverty levels is estimated to decrease HCV residency counts by 1.6, 1.3, and 1.3 percent, respectively. However, on the other hand, the effects of these variables are offset by the fact that for every $10,000 increase in median household income, the count of HCV residencies is expected to decrease by approximately 11 percent.[17] Based on the these results, it may be the case that HCV households are dispersing into less-poor

[17] A $10,000 dollar increase in the median HH income is associated with an IRR of 0.99999^10,000 ≈ .891.

moderate income neighborhoods, but unable to penetrate into affluent high-income neighborhoods.

Additional housing mobility and housing structure variables provide more detail of the characteristics that HCV households' exhibit. A one percentage point increase in percentage of renter-occupied homes is estimated to increase HCV residency counts by approximately 1.2 percent. This should be obvious, since tracts with larger rental housing supplies are more attractive to HCV households who can only rent. However, for a one percentage point increase in percentage of renters who moved in the past year is estimated to decrease HCV residency counts by about 0.5 percent.

With regard to housing structure characteristics, a 10 year increase in the median age of housing unit is estimated to increase HCV residency counts by 3.7 percent, which suggests that HCV households comparably reside in older housing units that presumably offer cheaper rents. On the other hand, a one percentage point increase in percentage of rental units that are detached 1-unit homes is estimated to decrease HCV residency counts by about 0.8 percent, respectively. Though, there should be many factors behind this particular result, one possible reason may be that detached 1-unit homes are relatively too expensive for the average HCV households' spending budgets.

Finally, a perhaps surprising result is that census tracts in the city of Chicago do not appear to have a positive effect on HCV residency counts. Per results, HCV residency count is estimated to decrease by over 40 percent for census tracts within the City of Chicago compared to those remaining tracts in the rest of Cook County. As seen in Table 37, the mean HCV residency count is much lower for those census tracts in the City of Chicago, though it must be cautioned that mean values for tracts in Chicago have

been estimated based on nearly twice the sample size of tracts outside Chicago. If interpreted as is, this result implies that, despite the existence of the city's source-of-income protection ordinance, HCV households increasingly tend to locate in suburban neighborhoods. However, this result should be interpreted with caution in that unwanted bias may have been introduced into the results due to missing data for HCV values in the year 2010.[18]

Table 37. Estimated Marginal Means for City of Chicago Variable

City of Chicago (if=1)	Mean	Delta-Method Std. Error	95% Wald CI	
			Lower	Upper
1	13.460	0.7304	12.029	14.892
0	22.638	1.3381	20.015	25.261

*Covariates in the model are fixed at mean values.

Further Analysis of the Magnitude of Effects on HCV Residency Counts

Though the regression results show that the count of foreclosure sales variables and many of the additional control variables are statistically significant predictors of HCV residency counts, the low unstandardized coefficient and incidence rate ratio values make it somewhat difficult to fully interpret the magnitude of each independent variable's effect on HCV residency counts. In fact, based on IRR values in Table 36, most of the independent variables appear to have a marginal effect on HCV residency counts, where IRR values can more or less be rounded to 1 (i.e., no effect). Therefore, the following

[18] I have previously noted that most (if not all) of the under-reporting that occurred in the year 2010 for HCV household figures originated from within-city census tracts.

table was estimated to further analyze the magnitude of each independent variable's effect on HCV residency counts.

As seen in Table 38, a one standard deviation increase in the count of current year and prior year foreclosure sales is expected to increase the count of HCV residencies by approximately 13 and 10 percent, respectively. As such, the magnitude of the effect does not appear to be trivial, though not a substantially large effect. Also, though the size of the foreclosure sales effect is comparable (or slightly larger) with the effects of other independent variables in the model, it does appear that the percentage African American, median household income, and percentage in poverty variables have the most commanding effects on the count of HCV residencies.

Table 38. Expected Proportional Change in the Count of HCVs (N = 7,707)

			Expected % Change in Y		
VARIABLE	COEFF[a]	SD of IV[b]	1/10 SD-X	1/2 SD-X	1 SD-X
fcsales	0.00879***	13.82	1.012	1.063	1.129
lag of fcsales	0.00682***	13.82	1.009	1.048	1.095
total population	0.00020***	2,543.87	1.052	1.290	1.671
percent Black	0.02923***	38.72	1.120	1.760	3.100
percent Asian	0.01258*	9.03	1.011	1.059	1.120
percent Latino	0.01171***	26.28	1.031	1.166	1.360
percent public assistance	-0.01607*	4.34	0.993	0.966	0.933
median HH income	-0.00001***	28,830.02	1.000	1.000	0.717
percent female-headed HH	0.00730***	17.80	1.013	1.067	1.139
pct unemployment	-0.01355***	8.68	0.988	0.943	0.889
pct renters moved in past yr	-0.00456**	13.64	0.994	0.969	0.939
pct renter-occupied homes	0.01200***	23.45	1.029	1.151	1.325
percent foreign-born	-0.00468	15.23	0.993	0.965	0.931
pct rental units under FMR	-0.00099	22.58	0.998	0.989	0.978
rental vacancy rate	0.00540	6.39	1.003	1.017	1.035
percent poverty	-0.01300***	14.31	0.982	0.911	0.831
median age of housing unit	0.00359**	28.02	1.010	1.052	1.106
pct detached 1-unit rent homes	-0.00791***	22.57	0.982	0.915	0.837
City of Chicago, Illinois	-0.51988***	0.48	0.976	0.884	0.781

Notes

a. Unstandardized coefficients. b. Standard deviation of IV. * p < 0.1; ** p < 0.05; *** p < 0.01

5.3.2. Model Results – Cuyahoga County, Ohio

5.3.2.1. Descriptive Statistics

The same negative binomial regression method used for Cook County was replicated here using Cuyahoga County's dataset. Table 39 presents the basic descriptive statistics for all variables used in the Cuyahoga County data analysis. The mean, standard deviation and the ranges of each variable used in the analysis are shown. HCV counts averaged 30.17 per census tract with a range of 0 to 405. Foreclosure sale counts averaged 12.54 per tract with a range of 0 to 110. Overall, it appears the county has a strong presence of African-Americans, which comprise 39 percent of the sample population. However, the presence of other racial minority ethnicities is quite low with Asians and Latinos comprising only 2.5 and 5.3 percent of the sample population, respectively. The presence of foreign-born residents is also quite low as it comprises slightly over 6 percent of the sample population, respectively.

Among additional socio-economic variables none of the mean values appear to be over-pronounced. It does appear there is some residential instability, in that renter-occupied units comprise about 44 percent of the sample, where nearly 30 percent of residents in these units have moved in the past year. Rental vacancy rate seems average at 9 percent, while half of the rental housing stock is priced below (or at) the FMR for the county. The median age of housing units is quite high at 60 years since built. Though each of the mean values of these various socio-economic and housing characteristics appear average overall, the wide value ranges of each variable suggest that there may be a stark contrast of characteristic values among individual census tracts.

Table 39. Cuyahoga County Descriptive Statistics (Valid N-Pairings = 2,976)

Variables	MIN	MAX	MEAN	SD
hcv (DV)	0.00	405.00	30.17	40.28
fcsales	0.00	110.00	12.54	13.56
tpop	0.89	10280.68	2571.18	1466.46
pctblack	0.00	100.00	38.98	36.60
pctasian	0.00	40.67	2.45	4.70
pctlatino	0.00	53.33	5.25	8.01
pctpubass	0.00	30.15	5.09	4.77
medHHinc	6146.00	212321.00	43692.81	26429.57
pctfemalehh	0.00	82.80	25.30	17.09
pctunemp	1.50	79.20	14.89	10.32
pctmoved	0.00	100.00	29.80	14.54
pctrentocc	1.19	100.00	43.87	25.34
pctforborn	0.00	36.94	6.43	6.09
pcthudfmr	0.00	100.00	49.82	25.59
pctvacancy	0.00	44.60	9.04	8.40
pctpoverty	0.45	80.08	23.23	18.05
medhsage	9.00	73.00	59.96	14.34
pctd1unit	0.00	100.00	34.02	26.98
central	0.00	1.00	0.45	0.50

Returning to the two primary variables of interest, Table 40 shows average tract counts for HCV and foreclosure sales by year. In general, the mean of HCV counts has held relatively constant over the study duration. However, the mean of foreclosure sales counts have increased two-folds from 2006 to 2007, but then have steadily decreased afterwards, with 2011 count values being lower than pre-2007.

Table 40. Total HCV & Foreclosure Sales by Year in Cuyahoga County

	Valid N	MIN	MAX	Mean	Std. Dev.
hcv					
2006	501	0	377	28.04	37.92
2007	501	0	405	30.22	40.62
2008	501	0	392	29.64	39.28
2009	501	0	384	30.46	40.51
2010	501	0	383	30.64	41.29
2011	501	0	389	30.21	41.52
fcsales					
2006	501	0	66	10.85	11.48
2007	501	0	110	20.00	21.06
2008	501	0	103	15.08	14.07
2009	501	0	62	10.74	9.53
2010	501	0	48	9.71	8.60
2011	501	0	97	8.21	8.27

Table 41 shows the mean HCV count by the number of foreclosure sales in ascending order. Similar to Cook County, the table shows that mean HCV count in a census tract steadily increases in general, as the number of foreclosures increase. For example, the mean HCV count per census tract in tracts with zero foreclosures was over four times less than tracts with four foreclosures, and ten times less than tracts with 14 foreclosures. Figure 19 provides visual illustration of this relationship. There appears to be a positive linear relationship between the two variables, where HCV counts increase as the number of foreclosures increase.

Table 41. Mean HCV Count by Foreclosure Sales in Cuyahoga County

No.# of FCSales	Observations	Mean HCV Count
0	245	3.02
1	155	10.08
2	164	14.81
3	173	14.94
4	192	15.55
5	173	23.27
6	166	20.48
7	123	18.75
8	133	23.97
9	121	18.23
10	114	28.84
11	96	29.33
12	112	29.15
13	83	30.74
14	76	31.28
15 or more	880	56.88
TOTAL	3006	

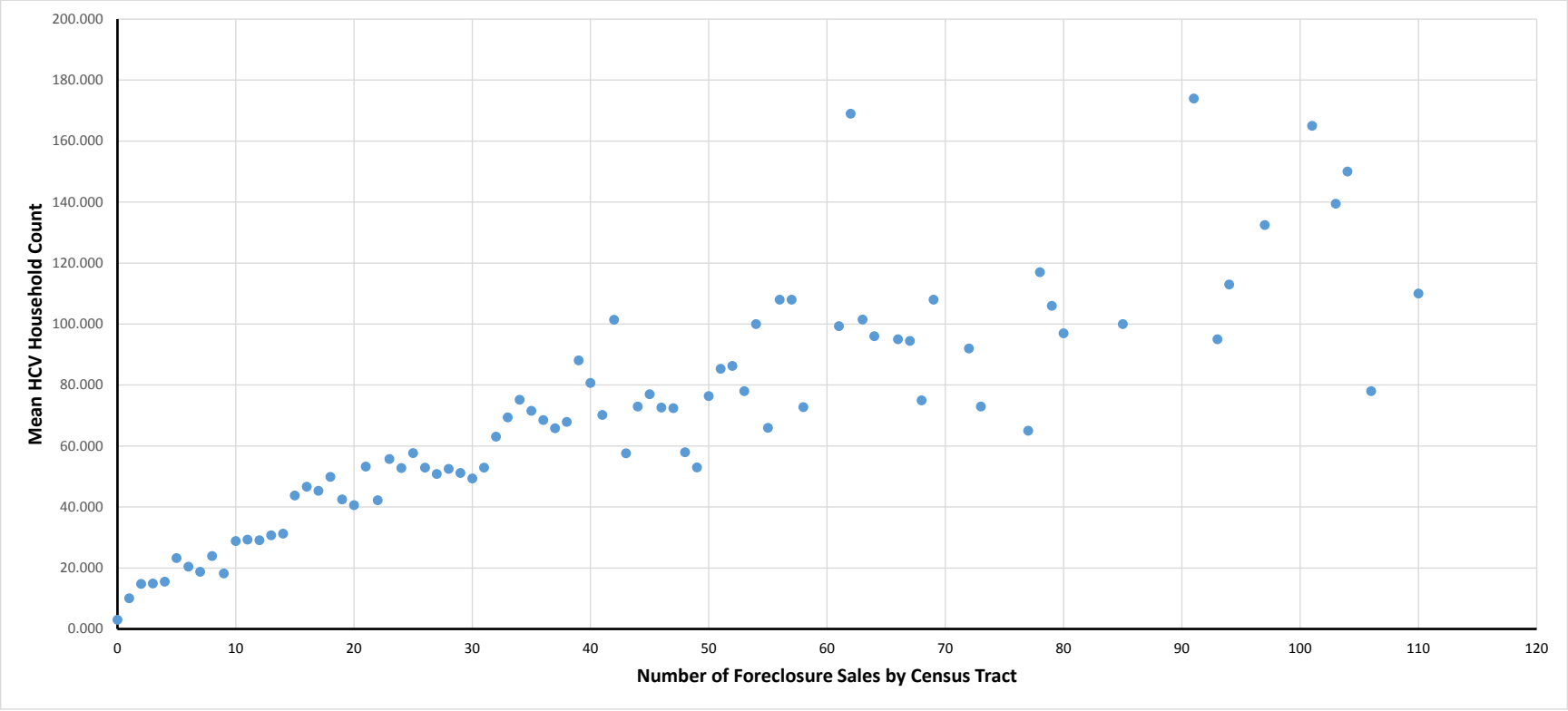

Figure 19. Mean HCV Count by Foreclosure Sales in Cuyahoga County

5.3.2.2. Regression Results

Table 42 shows the results of the negative binomial regression model with all previously specified and selected variables included. The model Wald ratio chi-square test figure of 992.94, $p < 0.01$, indicates that the set of predictor variables as a whole are statistically significant. Both current and lagged values of the count of foreclosure sales variable are found to be a statistically significant predictor ($p < 0.01$) of HCV residency counts in a census tract. Holding other variables constant, for every one unit increase in current year and prior year foreclosure sales, the count of HCV residencies is expected to increase by approximately 1.5 and 1.6 percent, respectively. Though these estimates are nearly twice the size compared to Cook County results, the effect magnitudes still appear to be relatively modest. However, the statistically significant results do support the hypothesis that foreclosure sales exhibit a direct positive effect on HCV residency counts.

Several additional control variables were found to be statistically insignificant predictors of HCV residencies. The percentage of families receiving public assistance, percentage of female-headed households, percentage of renters who moved in the past year, percentage foreign-born residents, percentage of rental units under U.S. HUD's FMR, and the percentage of detached 1-unit rent homes variables were all found to be statistically insignificant at any acceptable level (i.e., $p < 0.10$).

Table 42. NBReg Model Results for Cuyahoga County (N = 2,976)

VARIABLE	COEFF[a]	Robust SE[b]	P-Value	IRR
(Intercept)	-1.15392**	0.48282	0.017	—
fcsales	0.01450***	0.00235	0.000	1.01450
lag of fcsales	0.01558***	0.00242	0.000	1.01570
total population	0.00042***	0.00005	0.000	1.00042
percent Black	0.02010***	0.00175	0.000	1.02030
percent Asian	-0.04348***	0.01254	0.001	0.95746
percent Latino	0.03161***	0.00604	0.000	1.03212
percent public assistance	0.00488	0.01059	0.645	1.00489
median HH income	-0.00002***	0.00000	0.000	0.99998
percent female-headed HH	0.00481	0.00320	0.133	1.00482
pct unemployment	-0.01722***	0.00607	0.005	0.98293
pct renters moved in past yr	0.00167	0.00279	0.549	1.00167
pct renter-occupied homes	0.01219***	0.00343	0.000	1.01227
percent foreign-born	0.01462	0.01170	0.211	1.01472
pct rental units under FMR	0.00306	0.00261	0.241	1.00306
rental vacancy rate	0.01511***	0.00466	0.001	1.01523
percent poverty	-0.01150*	0.00604	0.057	0.98857
median age of housing unit	0.03823***	0.00471	0.000	1.03897
pct detached 1-unit rent homes	-0.00116	0.00226	0.609	0.99884
City of Cleveland, Ohio	-0.70449***	0.12162	0.000	0.49436
Year 2007	-0.10361***	0.02615	0.000	0.90157
Year 2008	-0.19010***	0.04008	0.000	0.82688
Year 2009	-0.00264	0.03025	0.930	0.99736
Year 2010	0.11128***	0.02758	0.000	1.11771
Year 2011	0.14278***	0.03038	0.000	1.15348
(Negative binomial)[c]	0.62985***	0.05808	—	—
Wald ratio χ^2	992.94***			

Notes

a. Unstandardized coefficients.

b. SE for foreclosure related variables are not clustered, while all other control variables are clustered at the tract level.

c. This measures the significance of over-dispersion, where an estimate greater than zero suggests over-dispersion.

N = 2976 (496 observations * 6 years) * p < 0.1; ** p < 0.05; *** p < 0.01

Two racial minority variables are shown to have a positive effect on HCV residencies as expected, where a one percentage point increase in African-American and Latino populations is expected to increase HCV residency counts by 2.0 and 3.2 percent, respectively. Conversely, the percentage of Asian variable is shown to have a negative effect on HCV residencies, where a one percentage point increase in Asian population is expected to decrease HCV residency counts by 4.3 percent. Though not tested for, this may imply that the Asian population in Cuyahoga County is relatively more affluent compared to other racial minority ethnicities in the county.

As was the case with Cook County results, there also appears to be some discrepancy among the variables estimating HCV residency counts. The negative effects of two variables are consistent with prior HCV literature that HCV households are increasingly spreading towards better neighborhoods and are less likely to live in high-poverty neighborhoods (Galvez, 2010; McClure et al., 2015). A one percentage point increase in percentage unemployed and percentage living below federally-defined poverty levels is estimated to decrease HCV residency counts by 1.7 and 1.1 percent, respectively. However, on the other hand, the effects of these variables are offset by the fact that for every $10,000 increase in median household income, the count of HCV residencies is expected to decrease by approximately 20 percent. These results suggests a similar outcome to that of Cook County, where HCV households are dispersing into less-poor moderate income neighborhoods, but yet unable to penetrate into affluent high-income neighborhoods.

Additional housing availability and structure variables provide more detail of the characteristics that HCV households' in Cuyahoga County exhibit. Apparently the

amount of housing availability has a positive effect on HCV residency counts, where a one percentage point increase in the rental vacancy rate is expected to increase HCV counts by 1.5 percent, respectively. Also, the model shows that HCV units are increasingly found in older housing stock, where a one year increase in the median age of a housing unit is expected to increase HCV residency counts by about 4 percent, respectively.

Also, per regression results, HCV residency count is estimated to decrease by over 50 percent for census tracts within the City of Cleveland compared to those remaining tracts in the rest of Cuyahoga County. As seen in Table 43, the mean HCV residency count is much lower for those census tracts within the City of Cleveland. This finding coincides with results from the first two hypotheses and provides a good example where HCV households are increasingly gaining access to less-poor neighborhoods outside of the central city.

Table 43. Estimated Marginal Means for City of Cleveland Variable

City of Cleveland (if=1)	Mean	Delta-Method Std. Error	95% Wald CI	
			Lower	Upper
1	9.988	.8310	8.359	11.617
0	20.204	1.3470	17.564	22.844

*Covariates in the model are fixed at mean values.

Further Analysis of the Magnitude of Effects on HCV Residency Counts

As seen in Table 44, a one standard deviation increase in the count of current year and prior year foreclosure sales is expected to increase the count of HCV residencies by

approximately 22 and 24 percent, respectively. As such, the magnitude of the effect does not appear to be trivial and is substantially larger than the same effects observed in Cook County. Also, though the size of the foreclosure sales effect is relatively larger in comparison to the effects of other independent variables in the model, it does appear that the percentage African American and median household income variables have the most commanding effects on the count of HCV residencies.

Table 44. Expected Proportional Change in the Count of HCVs (N = 2,976)

			Expected % Change in Y		
VARIABLE	**COEFF[a]**	**SD of IV[b]**	**1/10 SD-X**	**1/2 SD-X**	**1 SD-X**
fcsales	0.01450***	13.56	1.020	1.103	1.216
lag of fcsales	0.01558***	13.56	1.021	1.112	1.238
total population	0.00042***	1,466.46	1.060	1.341	1.844
percent Black	0.02010***	36.60	1.076	1.445	2.087
percent Asian	-0.04348***	4.70	0.980	0.903	0.815
percent Latino	0.03161***	8.01	1.026	1.135	1.288
percent public assistance	0.00488	4.77	1.002	1.012	1.024
median HH income	-0.00002***	26,429.57	1.000	1.000	0.556
percent female-headed HH	0.00481	17.09	1.008	1.042	1.086
pct unemployment	-0.01722***	10.32	0.982	0.915	0.837
pct renters moved in past yr	0.00167	14.54	1.002	1.012	1.025
pct renter-occupied homes	0.01219***	25.34	1.031	1.167	1.362
percent foreign-born	0.01462	6.09	1.009	1.045	1.093
pct rental units under FMR	0.00306	25.59	1.008	1.040	1.081
rental vacancy rate	0.01511***	8.40	1.013	1.065	1.135
percent poverty	-0.01150*	18.05	0.979	0.901	0.813
median age of housing unit	0.03823***	14.34	1.056	1.315	1.730
pct detached 1-unit rent homes	-0.00116	26.98	0.997	0.984	0.969
City of Cleveland, Ohio	-0.70449***	0.50	0.966	0.839	0.705

Notes

a. Unstandardized coefficients. b. Standard deviation of IV. * p < 0.1; ** p < 0.05; *** p < 0.01

5.3.3. Model Results – Mecklenburg County, North Carolina

5.3.3.1. Descriptive Statistics

The negative binomial regression method used for the previous counties was once again replicated here using Mecklenburg County's dataset. Table 45 shows the basic descriptive statistics for all variables used in the Mecklenburg County data analysis. The mean, standard deviation and the ranges of each variable used in the analysis are shown. HCV counts averaged 30.55 per census tract with a range of 0 to 168. Foreclosure sale counts averaged 26.88 per tract with a range of 0 to 310. It appears the county has a good racial minority ethnicity mix of African-Americans and Latinos, which comprise 33 and 11 percent of the sample population, respectively. However, the presence of Asian population is quite low, where Asians comprise only 3.8 percent of the sample population. The presence of foreign-born residents appears average as it comprises 12.5 percent of the sample population, respectively.

Among additional socio-economic variables none of the mean values appear to be over-pronounced. It does appear there that residential mobility is more pronounced compared to the other study counties, in that renter-occupied units comprise about 43 percent of the sample, where over 37 percent of residents in these units have moved in the past year. Rental vacancy rate seems to be quite low at 6.6 percent, where only a little over a third (i.e., 38 percent) of the rental housing stock is priced below (or at) HUD's FMR for the county. The housing stock appears relatively young, where the median age of housing units is 30.5 years since built. Once again, though each of the mean values of these various socio-economic and housing characteristics appear average

overall, the wide value ranges of each variable suggest that there may be a stark contrast of characteristic values among individual census tracts.

Table 45. Mecklenburg County Descriptive Statistics (Valid N-Pairings = 858)

Variables	MIN	MAX	MEAN	SD
hcv (DV)	0.00	168.00	30.77	36.31
fcsales	0.00	310.00	27.06	36.83
tpop	378.00	28500.00	6481.62	4267.36
pctblack	0.77	97.59	32.93	27.27
pctasian	0.00	20.18	3.81	3.47
pctlatino	0.00	51.58	11.00	10.79
pctpubass	0.00	11.59	2.20	2.23
medHHinc	11984.00	213631.00	58936.67	29460.37
pctfemalehh	0.00	59.90	20.43	14.07
pctunemp	1.10	38.40	11.33	7.16
pctmoved	2.75	76.19	37.65	13.34
pctrentocc	2.82	97.82	42.86	22.07
pctforborn	0.61	42.13	12.59	8.64
pcthudfmr	0.00	83.33	38.26	21.69
pctvacancy	0.00	23.10	6.63	5.37
pctpoverty	1.30	69.32	17.46	13.97
medhsage	10.00	70.00	30.51	14.52
pctd1unit	0.00	95.69	32.50	24.32
central	0.00	1.00	0.94	0.24

Returning to the two primary variables of interest, Table 46 shows average tract counts for HCV and foreclosure sales by year. In general, the mean of HCV counts has held relatively constant over the study duration, though there appears to be a slight dip in

2011.[19] The mean of foreclosure sales counts have skyrocketed in 2009 and 2010, however the 2011 count shows values similar to those before 2009.

Table 46. Total HCV & Foreclosure Sales by Year in Mecklenburg County

	Valid N	MIN	MAX	Mean	Std. Dev.
hcv					
2006	144	0	168	31.47	37.06
2007	144	0	161	30.30	36.72
2008	144	0	158	31.12	37.71
2009	144	0	136	30.31	36.14
2010	144	0	157	33.98	39.39
2011	144	0	126	26.15	30.14
fcsales					
2006	144	0	97	18.89	22.54
2007	144	0	103	17.49	21.86
2008	144	0	84	14.24	17.84
2009	144	0	178	34.63	36.68
2010	144	0	310	58.79	60.76
2011	144	0	89	17.22	17.99

Table 47 shows the mean HCV count by the number of foreclosure sales in ascending order. Similar to the previous study counties, the table shows that mean HCV count in a census tract steadily increases in general, as the number of foreclosures increase. However, the relationship appears a bit more muddled compared to the previous counties with dips and rises in the number of HCV counts for increased numbers

[19] As stated in the analysis for the first two hypotheses, there appears to be an issue of under-reporting for HCV figures in year 2011.

of foreclosure sales. For example, though the mean HCV count per census tract in tracts with zero foreclosures was over four times less than tracts with four foreclosures, having eight foreclosures resulted in less HCV counts than tracts with seven foreclosures. Figure 20 provides visual illustration of this relationship. The relationship appears to be roughly linear at the beginning, though as the number of foreclosure sales increase, this results in more variation in mean HCV counts. Thus, Figure 20 is noisier than the corresponding plots for Cook County and Cuyahoga County.

Table 47. Mean HCV Count by FC Sales in Mecklenburg County

No.# of FCSales	Observations	Mean HCV Count
0	37	3.05
1	49	8.74
2	49	7.29
3	25	4.12
4	44	13.75
5	35	16.11
6	25	16.36
7	34	20.79
8	30	15.63
9	32	27.25
10	24	17.33
11	22	30.86
12	18	23.94
13	17	22.18
14	10	15.30
15 or more	413	47.74
TOTAL	864	

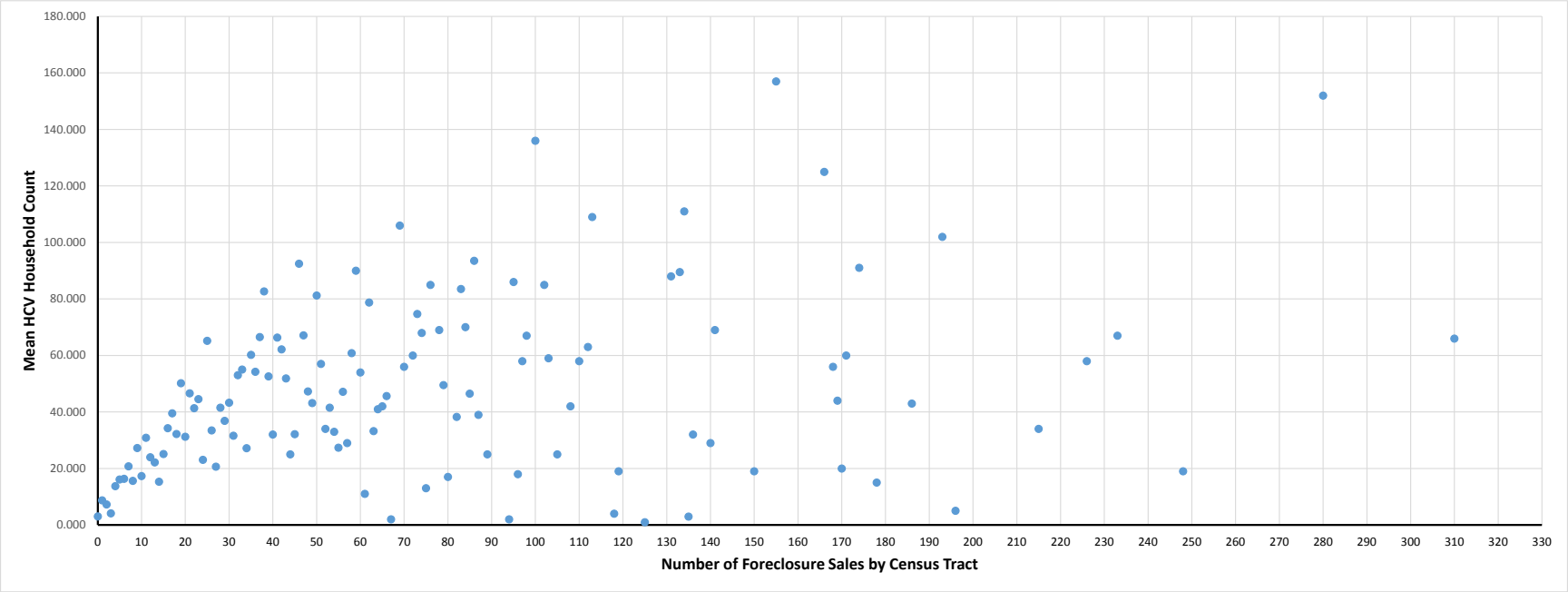

Figure 20. Mean HCV Count by Foreclosure Sales in Mecklenburg County

5.3.3.2. Regression Results

Table 48 shows the results of the negative binomial regression model with all previously specified variables included. The model Wald ratio chi-square test figure of 572.39, $p < 0.01$, indicates that the set of predictor variables as a whole are statistically significant. Both current and lagged values of the count of foreclosure sales variable are found to be a statistically significant predictor ($p < 0.05$) of HCV residency counts in a census tract. Holding other variables constant, for every one unit increase in either current year or prior year foreclosure sales, the count of HCV residencies is expected to increase by approximately 0.4 percent, respectively.

As such, the size of the effect is even more modest compared to the other study counties' model results. The extremely modest effect magnitude may be a consequence of the relatively small sample size ($n = 858$) used in the regression model, though as shown previously in Figure 20, the bivariate relationship between foreclosures and mean HCV counts is also unclear. However, though the effect of foreclosure sales on HCV residency counts may be very modest, the relationship was nonetheless found to be statistically significant.

Table 48. NBReg Model Results for Mecklenburg County (N = 858)

VARIABLE	COEFF[a]	Robust SE[b]	P-Value	IRR
(Intercept)	0.22001	1.32489	0.868	—
fcsales	0.00435***	0.00174	0.010	1.00436
lag of fcsales	0.00435***	0.00167	0.009	1.00436
total population	0.00006*	0.00003	0.066	1.00006
percent Black	0.02290***	0.00770	0.003	1.02317
percent Asian	-0.00087	0.02274	0.969	0.99913
percent Latino	0.02521	0.01740	0.147	1.02553
percent public assistance	-0.08656*	0.04820	0.072	0.91708
median HH income	-0.00002**	0.00001	0.019	0.99998
percent female-headed HH	0.02662***	0.00936	0.004	1.02698
pct unemployment	-0.05578***	0.02171	0.010	0.94575
pct renters moved in past yr	0.01294*	0.00681	0.058	1.01302
pct renter-occupied homes	0.03038***	0.00868	0.000	1.03085
percent foreign-born	-0.01338	0.02310	0.562	0.98671
pct rental units under FMR	0.01440*	0.00788	0.068	1.01450
rental vacancy rate	0.01001	0.01346	0.457	1.01006
percent poverty	-0.01545	0.01394	0.268	0.98467
median age of housing unit	-0.00818	0.00726	0.260	0.99185
pct detached 1-unit rent homes	0.01914***	0.00485	0.000	1.01933
City of Charlotte, NC	-0.04164	0.48926	0.932	0.95921
Year 2007	-0.07693*	0.04141	0.063	0.92596
Year 2008	-0.03625	0.04497	0.420	0.96440
Year 2009	-0.11524**	0.05610	0.040	0.89115
Year 2010	-0.18280*	0.11125	0.100	0.83294
Year 2011	-0.36819***	0.09649	0.000	0.69199
(Negative binomial)[c]	0.69651***	0.10804	—	—
Wald ratio χ^2	572.39***			

Notes

a. Unstandardized coefficients.

b. SE for foreclosure related variables are not clustered, while all other control variables are clustered at the tract level.

c. This measures the significance of over-dispersion, where an estimate greater than zero suggests over-dispersion.

N = 858 (143 observations * 6 years) * p < 0.1; ** p < 0.05; *** p < 0.01

Further owing to the modest sample size for Mecklenburg County's analysis, many of the socio-economic and housing characteristics variables were found to be statistically insignificant at any acceptable level of significance ($p < 0.10$). Percentage of Asian population, percentage of Latino population, percentage of foreign-born residents, rental vacancy rate, percentage living below federally-defined poverty levels, median age of housing unit, and central city dummy variables were all found to be statistically insignificant. Furthermore, a few additional variables were only found to be statistically significant at the 0.10 p-value level. In all, only six control variables were found to be a statistically significant predictor ($p < 0.05$) of HCV residency counts in a census tract.

The percentage of rental units under HUD's FMR variable was found to be a statistically significant predictor ($p < 0.10$) of HCV residency counts in Mecklenburg County, where a one percentage point increase of this variable is estimated to increase HCV residency counts by 1.5 percent. This finding should be rather obvious, in that cheaper rents should lead to more HCV households, who most likely have limits to their spending budgets. Also, percentage of African-American population is shown to have a positive effect on HCV residencies as expected, where a one percentage point increase in African-American population is estimated to increase HCV residency counts by 2.3 percent, respectively.

The percentage of female-headed household variable appears to have a sizeable effect on HCV residency counts, where a one percentage point increase of this variable is estimated to increase HCV residency count by nearly 3 percent. Though not tested for in this model, this could suggest that many low-income female-headed households prefer to maintain HCV residency in poor neighborhoods where they have sufficient family and

friend support groups, rather than moving away to a less-poor neighborhood with insufficient support groups.

Additional housing mobility and housing structure variables provide more detail of the characteristics that HCV households' exhibit. A one percentage point increase in percentage of renter-occupied homes is estimated to increase HCV residency counts by 3.1 percent, which should be obvious since tracts with larger rental housing supplies are more attractive to HCV households who can only rent. Also, a one percentage point increase in the percentage of renters who moved in the past year is estimated to increase HCV residency counts by about 1.3 percent, which suggests that a small portion of the rental movers in Mecklenburg County were those with housing vouchers.

Contrary to the effect direction exhibited in the other study counties' results, a one percentage point increase in the percentage of single-detached 1-unit rental homes is expected to increase HCV residency counts by nearly 2 percent, respectively. Though the exact reasons behind this positive effect are unknown, one possible reason could be that Mecklenburg County has large patches of old single-detached housing units similar to that of Hamilton County, Ohio. In their survey analysis of the effects of the HCV program on suburban communities outside of Cincinnati, Varady et al. (2013) examines a cluster of HCV households residing in old and unattractive single-family homes with uniform and basic designs that are commonly rented to low-income households.

As was the case with the other study counties, there also appears to be some discrepancy among some of the variables estimating HCV residency counts. A one percentage point increase in percentage of families receiving public assistance ($p < 0.10$) and percentage unemployed is estimated to decrease HCV residency counts by 8.3 and

5.4 percent, respectively. However, on the other hand, the effects of these variables are offset by the fact that for every $10,000 increase in median household income, the count of HCV residencies is estimated to decrease by approximately 18.5 percent. Once again, this suggests that HCV households are dispersing into less-poor moderate income neighborhoods, but yet unable to penetrate into affluent high-income neighborhoods.

Lastly, the central city dummy variable was found to be statistically insignificant as expected. The issue is that most of the census tracts in Mecklenburg County lie all or partially in the City of Charlotte, save a few tracts in the northern area of the county. Therefore, even if the variable was found to be statistically significant, the resulting values would be inconclusive as Mecklenburg County is in fact more or less the City of Charlotte. In order to glean any information from this variable, the only reasonable way would be to add adjacent counties' data to the model, which cannot be performed in this dissertation due to limitations of data availability.

Further Analysis of the Magnitude of Effects on HCV Residency Counts

As seen in Table 49, a one standard deviation increase in the count of either current year or prior year foreclosure sales is expected to increase the count of HCV residencies by approximately 17.4 percent, respectively. As such, the magnitude of the effect does not appear to be trivial, though once again not substantial. Also, though the size of the foreclosure sales effect is comparable with the effects of other statistically significant independent variables in the model, it does appear that the percentage of African American and median household income variables have the most commanding effects on the count of HCV residencies.

Table 49. Expected Proportional Change in the Count of HCVs (N = 858)

			Expected % Change in Y		
VARIABLE	COEFF[a]	SD of IV[b]	1/10 SD-X	1/2 SD-X	1 SD-X
fcsales	0.00435***	36.83	1.016	1.082	1.174
lag of fcsales	0.00435***	36.83	1.016	1.082	1.174
total population	0.00006*	4,267.36	1.044	1.238	1.293
percent Black	0.02290***	27.27	1.064	1.366	1.867
percent Asian	-0.00087	3.47	1.000	0.998	0.997
percent Latino	0.02521	10.79	1.028	1.146	1.313
percent public assistance	-0.08656*	2.23	0.981	0.908	0.825
median HH income	-0.00002**	29,460.37	1.000	1.000	0.546
percent female-headed HH	0.02662***	14.07	1.038	1.206	1.454
pct unemployment	-0.05578***	7.16	0.961	0.819	0.671
pct renters moved in past yr	0.01294*	13.34	1.017	1.090	1.188
pct renter-occupied homes	0.03038***	22.07	1.069	1.399	1.955
percent foreign-born	-0.01338	8.64	0.988	0.944	0.891
pct rental units under FMR	0.01440*	21.69	1.032	1.169	1.367
rental vacancy rate	0.01001	5.37	1.005	1.027	1.055
percent poverty	-0.01545	13.97	0.979	0.897	0.806
median age of housing unit	-0.00818	14.52	0.988	0.942	0.888
pct detached 1-unit rent homes	0.01914***	24.32	1.048	1.261	1.593
City of Charlotte, NC	-0.04164	0.24	0.999	0.995	0.990

Notes

a. Unstandardized coefficients. b. Standard deviation of IV. * p < 0.1; ** p < 0.05; *** p < 0.01

5.3.4. Summary of Three-County Regression Model Results

Based on the descriptive statistics for each respective county's datasets, HCV residency and foreclosure sales counts exhibited a roughly positive linear relationship, while successive negative binomial regression models for the three counties verify that there is a statistically significant positive relationship between the two variables of primary interest. However, the size of the effect is relatively modest across all three counties' estimations.

As seen in Table 50, in Cook County, holding other variables constant, a one unit increase in current and prior year foreclosure sales is estimated to increase the count of HCV residencies by 0.9 and 0.7 percent, respectively. In Cuyahoga County, a one unit increase in current and prior year foreclosure sales is estimated to increase HCV residencies by 1.5 and 1.6 percent, respectively. Finally, in Mecklenburg County, the HCV residency count is expected to increase by 0.4 percent for a one unit increase in either current or prior year foreclosure sales.

Table 50. Comparison of Hypothesis 3 Model Testing Results

Hypothesis 3: Higher levels of foreclosures in a census tract increase the number of HCV units in the same neighborhood.						
NBReg Regression Model Output - Comparison of Key Independent Variables						
Variable	**Cook County (n = 7,707)**		**Cuyahoga County (n = 2,976)**		**Meck County (n = 858)**	
	IRR[a]	**SE**	**IRR**	**SE**	**IRR**	**SE**
fcsales	1.00883***	0.002	1.01450***	0.002	1.00436***	0.002
lag of fcsales	1.00684***	0.002	1.01570***	0.002	1.00436***	0.002
pct% Black	1.02966***	0.002	1.02030***	0.002	1.02317***	0.008
median HH income	0.99999***	0.000	0.99998***	0.000	0.99998**	0.000
pct% poverty	0.98712***	0.004	0.98857*	0.006	0.98467	0.014

Notes

a.Incidence rate ratio values

* p < 0.1; ** p < 0.05; *** p < 0.01

Though effect magnitudes are relatively modest, the three-county model estimations return consistent evidence that the count of foreclosure sales exhibit a direct positive effect on HCV residency counts. Also, though the results of the preceding two hypotheses have shown that the distribution characteristics of HCV households differed across each study county, the fairly narrow range of the foreclosure variables' effects further suggest the robustness of this effect across the three study counties.

Additionally, several socio-economic and housing variables were shown to have consistent effects (all positive or all negative) on HCV residency counts for all three county model results. In particular, the percentage of African-American population exhibits a positive effect on HCV residency counts across all three county model results as expected. Also, both median household income and percentage poverty[20] had a consistent negative effect on HCV residency counts. As such, the interpretation of key control variables suggests that HCV households are finding their way into less-poor, but still not very rich neighborhoods across all three respective study counties.

5.4. Hypothesis Testing 4

In order to estimate the final hypothesis, interaction terms were introduced into the previously specified negative binomial regression models in order to predict the effect of foreclosures on HCV count in tracts with different levels of socio-economic status. In order to increase the statistical power of the models with modest sample observations, the foreclosure variables were pooled into a 2-year variable and then logged. This

[20] It should be noted that for Mecklenburg County this variable was found to be statistically insignificant. However, the sign direction of the ratio is consistent with the other study counties' estimations.

transformed variable interacts with only one selected socio-economic variable per each model output. As such, I report two models for each county where the transformed foreclosure variable interacts with percentage White in the first model and then median household income (or percentage poverty for Cuyahoga County) in the second model.

As specified in the model estimating the previous hypothesis, all six presented models were controlled for heteroscedasticity and serial auto-correlation. Also, collinearity diagnostic tests for all six models indicate that multicollinearity should not have an adverse effect on each models' results.

5.4.1. Cook County Interaction Model Results

Two models were estimated with the percent White variable and median household income variable interacting with the 2-year pooled and logged foreclosure variable in each model (see Table 51). As observed in Model 1, the interaction term between the 2-year foreclosure variable and percent White variable was found to be statistically significant predictor of HCV residency counts ($p < 0.01$). As expected, the operator (or sign) of the unstandardized coefficient was found to be negative, which suggests that foreclosures in areas with more White population have less of a positive impact on HCV counts. As observed in Model 2, the interaction term between the 2-year foreclosure variable and median household income was also found to be statistically significant ($p < 0.01$), while the sign of the coefficient was negative as expected. This suggests that foreclosures in higher-income tracts have less of an impact on HCV residency counts.

Table 51. NBReg Interaction Model Results for Cook County, Illinois

	Interaction Model 1 (FCS * pctwhite)				Interaction Model 2 (FCS * income)			
VARIABLES	COEFF[a]	Robust SE[b]	P-Value	IRR	COEFF[a]	Robust SE[b]	P-Value	IRR
(Intercept)	4.10370***	0.42017	0.000	—	4.24812***	0.37909	0.000	—
log of fcsales (2YR pool)	0.09796***	0.01605	0.000	1.103	0.09093***	0.01355	0.000	1.095
INT(fcsales2yr*pctwhite)	-0.00089***	0.00026	0.001	0.999	—	—	—	—
INT(fcsales2yr*income)	—	—	—	—	-0.00000***	0.00000	0.004	1.000
total population	0.00020***	0.00002	0.000	1.000	0.00021***	0.01139	0.000	1.000
percent White	-0.02288***	0.00217	0.000	0.977	-0.02454***	0.00193	0.000	0.976
percent Asian	-0.00981	0.00715	0.170	0.990	-0.00959	0.00705	0.174	0.990
percent Latino	-0.00131	0.00235	0.579	0.999	-0.00096	0.00230	0.676	0.999
percent public assistance	-0.01576*	0.00898	0.079	0.984	-0.01432	0.00910	0.116	0.986
median HH income	-0.00001***	0.00000	0.000	1.000	-0.00943***	0.00870	0.000	1.000
percent female-headed HH	0.00891***	0.00259	0.001	1.009	0.00870***	0.00260	0.001	1.009
pct unemployment	-0.01043**	0.00512	0.041	0.990	-0.01063**	0.00520	0.041	0.989
pct renters moved in past yr	-0.00599**	0.00236	0.011	0.994	-0.00586**	0.00236	0.013	0.994
pct renter-occupied units	0.01339***	0.00266	0.000	1.013	0.01334***	0.00266	0.000	1.013
percent foreign-born	-0.00852*	0.00512	0.096	0.992	-0.00973*	0.00502	0.053	0.990
pct rental units under FMR	-0.00054	0.00250	0.827	0.999	-0.00106	0.00235	0.651	0.999
rental vacancy rate	0.00780	0.00516	0.131	1.008	0.00771	0.00503	0.125	1.008
percent poverty	-0.01114***	0.00431	0.010	0.989	-0.01234***	0.00423	0.004	0.988
median age of housing unit	0.00325*	0.00172	0.060	1.003	0.00345**	0.00175	0.048	1.003
pct detached 1-unit rent homes	-0.00555***	0.00192	0.004	0.994	-0.00521***	0.00192	0.007	0.995
City of Chicago, Illinois	-0.51130***	0.08970	0.000	0.600	-0.51004***	0.08821	0.000	0.600
Year 2007 dummy	-0.02358	0.02682	0.379	0.977	-0.03660*	0.02159	0.090	0.964
Year 2008 dummy	-0.06209*	0.03443	0.071	0.940	-0.07726***	0.02814	0.006	0.926
Year 2009 dummy	-0.05688	0.03720	0.126	0.945	-0.07323**	0.03101	0.018	0.929
Year 2010 dummy	-0.24607***	0.04498	0.000	0.782	-0.26066***	0.04069	0.000	0.771
Year 2011 dummy	-0.01053	0.04335	0.808	0.990	-0.02758	0.03942	0.484	0.973
(Negative binomial)[c]	0.83211***	0.05152	—	—	0.83415***	0.04997	—	—
Wald ratio χ^2	3042.76***				2913.71***			

Notes

a. Unstandardized coefficients

b. SE for foreclosure related variables are not clustered, while all other control variables are clustered at the census tract level.

N = 7,707 observations

c. This measures the significance of over-dispersion, where an estimate greater than zero suggests over-dispersion.

* p < 0.1; ** p < 0.05; *** p < 0.01

The interaction terms' effects on the count of HCV residencies is more clearly shown in the following charts. Figure 21 shows the effect of foreclosures on HCV counts at various levels of percentage White population. Holding other variables constant, for every percent increase in the 2-year foreclosure sales variable, the count of HCV residencies is expected to increase by approximately 9.8 percent, when Whites comprise only 5 percent of the population.[21] However, the effect of foreclosure sales on HCV count steadily decreases as the percentage of White population in a tract increases, though the effect is still shown to be positive. As such, foreclosures in areas with more White population have less of a positive impact on HCV counts.

Figure 22 shows the effect of foreclosures on HCV counts at various levels of median household income. Holding other variables constant, for every percent increase in the 2-year foreclosure sales variable, the count of HCV residencies is expected to increase by approximately 8.7 percent, when the tract median household income is $10,000 USD. However, the effect of foreclosure sales on HCV count decreases as the tract median household income increases, where the effect overturns from a positive effect to a negative effect in neighborhoods with extremely high median household incomes. As such, foreclosures in higher median household income tracts have less of an impact on HCV residency counts, while foreclosures in extremely high median household income tracts are shown to have a negative impact on HCV counts.

[21] Since both the dependent and independent variables are log-transformed, the first-order derivative can be seen as $(\partial Y/Y)/(\partial X/X)$ and interpreted as the proportional change in *Y* for a proportional change in *X*, or multiplied by 100 and interpreted as the percentage change in *Y* for a percentage change in *X*.

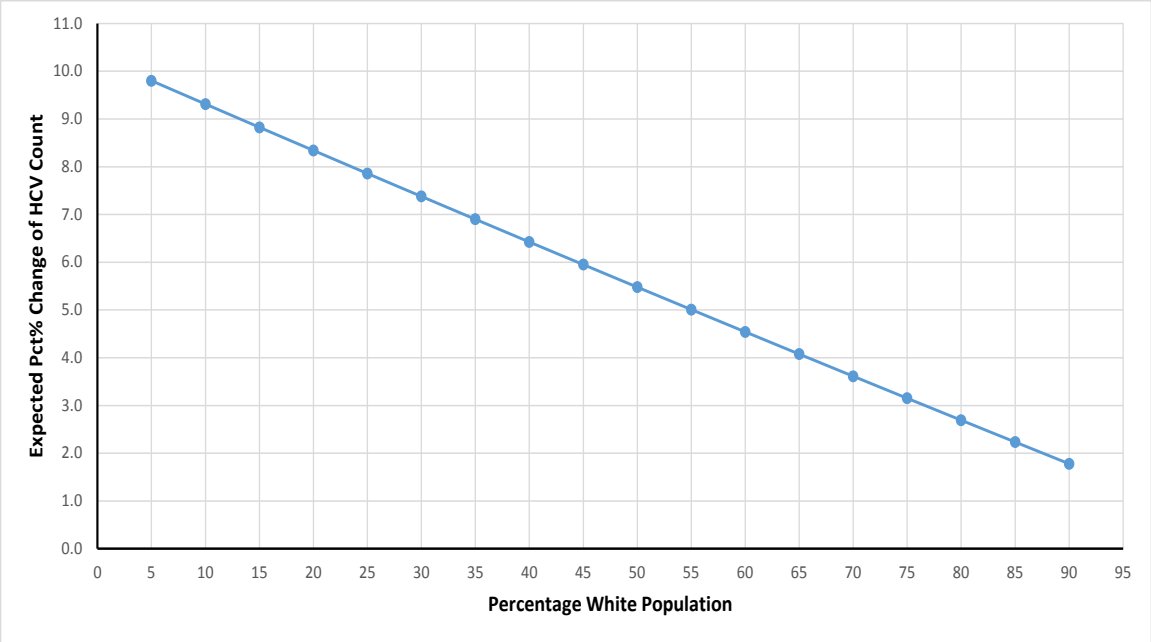

Figure 21. Effect of FC Sales on HCV Count by White Pop. Levels in Cook County

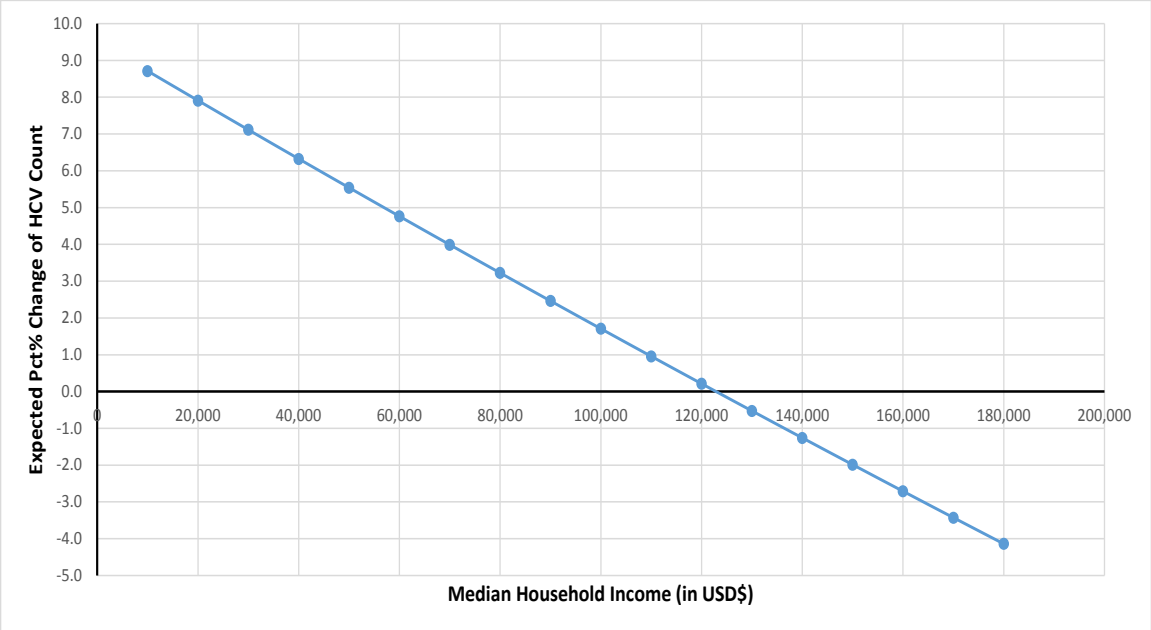

Figure 22. Effect of FC Sales on HCV Count by Income Levels in Cook County

With regard to the additional control variables, almost all of the variables in each model exhibit the same coefficient direction sign and significance levels. Also, though not directly comparable, the two models exhibit similarities in the coefficient effect direction and significance levels with the previously estimated un-pooled un-logged no-interaction model. As seen in Table 52, only four of the control variables switched from being statistically significant to insignificant (or vice versa) from the previous model to the two interaction models.

Table 52. Comparison of NBReg Models' Coefficients for Cook County

	NO Pool / NO Log / NO Interaction		2YR LogFCS / INT-pctwhite		2YR LogFCS / INT-income	
	Sign of Coeff[a]	P-Value	Sign of Coeff	P-Value	Sign of Coeff	P-Value
Primary Predictor Variables						
(Intercept)	plus	SIG***	plus	SIG***	plus	SIG***
fcsales (1YR)	plus	SIG***				
lag of fcsales (1YR)	plus	SIG***				
log of fcsales (2YR pool)			plus	SIG***	plus	SIG***
INT(fcsales2yr*pctwhite)			minus	SIG***		
INT(fcsales2yr*income)					minus	SIG***
Additional Control Variables						
total population	plus	SIG***	plus	SIG***	plus	SIG***
percent Black	plus	SIG***				
percent White			minus	SIG***	minus	SIG***
percent Asian	plus	SIG*	minus	INSIG	minus	INSIG
percent Latino	plus	SIG***	minus	INSIG	minus	INSIG
percent public assistance	minus	SIG*	minus	SIG*	minus	INSIG
median HH income	minus	SIG***	minus	SIG***	minus	SIG***
percent female-headed HH	plus	SIG***	plus	SIG***	plus	SIG***
pct unemployment	minus	SIG***	minus	SIG**	minus	SIG**
pct renters moved in past yr	minus	SIG**	minus	SIG**	minus	SIG**
pct renter-occupied units	plus	SIG***	plus	SIG***	plus	SIG***
percent foreign-born	minus	INSIG	minus	SIG*	minus	SIG*
pct rental units under FMR	minus	INSIG	minus	INSIG	minus	INSIG
rental vacancy rate	plus	INSIG	plus	INSIG	plus	INSIG
percent poverty	minus	SIG***	minus	SIG***	minus	SIG***
median age of housing unit	plus	SIG**	plus	SIG*	plus	SIG**
pct detached 1-unit rent homes	minus	SIG***	minus	SIG***	minus	SIG***
central city dummy	minus	SIG***	minus	SIG***	minus	SIG***

Notes

a. Coefficients for each model are unstandardized coefficients.

* p < 0.1; ** p < 0.05; *** p < 0.01

5.4.2. Cuyahoga County Interaction Model Results

For Cuyahoga County, two models were estimated with the percentage White variable and percentage poverty variable interacting with the 2-year pooled and logged foreclosure variable in each model.[22] As observed in Model 3, the interaction term between the 2-year foreclosure variable and percent White variable was found to be a statistically significant predictor of HCV residency counts with a p-value of < 0.01 (see Table 53). As expected, the operator of the unstandardized coefficient is found to be negative, which suggests that foreclosures in areas with more White population have less of a positive impact on HCV counts.

As observed in Model 4, the interaction term of the 2-year foreclosure and percentage poverty variables was found to be statistically significant ($p < 0.01$). As expected, the coefficient effect direction is positive implying that foreclosures in areas with higher poverty should have a positive impact on HCV counts, while areas with lower poverty should have less of a positive impact on HCV counts.

[22] In order to preserve uniformity across county interaction models, the original intention was to use the two variables of percentage White and median household income to interact with the 2-year foreclosure variable in separate models. However, for Cuyahoga County only, interacting income with foreclosures continually yielded statistically insignificant results for the interaction term. Therefore, for this county only, the income variable interaction was replaced with the poverty variable interaction with foreclosures. Though the income and poverty variables cannot be considered as an apples-to-apples comparison, the poverty variable appeared to be the most valid proxy (or replacement) for the income variable among the control variables that were specified and analyzed in this dissertation.

Table 53. NBReg Interaction Model Results for Cuyahoga County, Ohio

	Interaction Model 3 (FCS * pctwhite)				Interaction Model 4 (FCS * poverty)			
VARIABLES	COEFF[a]	Robust SE[b]	P-Value	IRR	COEFF[a]	Robust SE[b]	P-Value	IRR
(Intercept)	0.08393	0.46132	0.856	—	0.62237	0.44979	0.166	—
log of fcsales (2YR pool)	0.28793***	0.02552	0.000	1.334	0.11839***	0.03017	0.000	1.126
INT(fcsales2yr*pctwhite)	-0.00175***	0.00046	0.000	0.998	—	—	—	—
INT(fcsales2yr*poverty)	—	—	—	—	0.00262***	0.00059	0.000	1.003
total population	0.00043***	0.00004	0.000	1.000	0.00043***	0.00004	0.000	1.000
percent White	-0.01632***	0.00259	0.000	0.984	-0.02178***	0.00161	0.000	0.978
percent Asian	-0.05289***	0.01169	0.000	0.948	-0.05242***	0.01207	0.000	0.949
percent Latino	0.02092***	0.00542	0.000	1.021	0.01912***	0.00526	0.000	1.019
percent public assistance	-0.00160	0.00992	0.872	0.998	-0.00271	0.00975	0.781	0.997
median HH income	-0.00002***	0.00000	0.000	1.000	-0.00002***	0.00000	0.000	1.000
percent female-headed HH	0.00595**	0.00295	0.044	1.006	0.00600**	0.00295	0.042	1.006
pct unemployment	-0.01611***	0.00568	0.005	0.984	-0.01713***	0.00569	0.003	0.983
pct renters moved in past yr	0.00292	0.00254	0.252	1.003	0.00293	0.00253	0.247	1.003
pct renter-occupied units	0.01804***	0.00331	0.000	1.018	0.01708***	0.00322	0.000	1.017
percent foreign-born	0.02039*	0.01125	0.070	1.021	0.02202*	0.01155	0.056	1.022
pct rental units under FMR	0.00174	0.00242	0.473	1.002	0.00183	0.00241	0.449	1.002
rental vacancy rate	0.01410***	0.00452	0.002	1.014	0.01293***	0.00448	0.004	1.013
percent poverty	-0.01141**	0.00551	0.038	0.989	-0.01770**	0.00565	0.002	0.982
median age of housing unit	0.03698***	0.00433	0.000	1.038	0.03776***	0.00429	0.000	1.038
pct detached 1-unit rent homes	0.00204	0.00214	0.341	1.002	0.00206	0.00211	0.329	1.002
City of Cleveland, Ohio	-0.57484***	0.11263	0.000	0.563	-0.58434***	0.11211	0.000	0.557
Year 2007 dummy	-0.07461***	0.02818	0.008	0.928	-0.06217**	0.02789	0.026	0.940
Year 2008 dummy	-0.09084**	0.04221	0.031	0.913	-0.08191**	0.04023	0.042	0.921
Year 2009 dummy	-0.00847	0.03333	0.799	0.992	-0.00314	0.03405	0.927	0.997
Year 2010 dummy	0.07152**	0.03509	0.042	1.074	0.06933**	0.03533	0.050	1.072
Year 2011 dummy	0.10798***	0.03796	0.004	1.114	0.10290***	0.03790	0.007	1.108
(Negative binomial)[c]	0.52854***	0.04501	—	—	0.52775***	0.04537	—	—
Wald ratio χ^2	1351.23***				1269.56***			

Notes

a. Unstandardized coefficients

b. SE for foreclosure related variables are not clustered, while all other control variables are clustered at the census tract level.

N = 2,976 observations

c. This measures the significance of over-dispersion, where an estimate greater than zero suggests over-dispersion.

* p < 0.1; ** p < 0.05; *** p < 0.01

The interaction terms' effects on the count of HCV residencies is more clearly shown in the following figures. Figure 23 shows the effect of foreclosures on HCV counts at various levels of percentage White population. Holding other variables constant, for every percent increase in the 2-year foreclosure sales variable, the count of HCV residencies is expected to increase by approximately 32.2 percent, when Whites comprise only 5 percent of the population. However, the effect of foreclosure sales on HCV count shows an inverse relationship as the percentage of White population in a tract increases, though the effect is still shown to be positive. As such, foreclosures in areas with more White population have less of a positive impact on HCV counts.

Figure 24 shows the effect of foreclosures on HCV counts at various poverty levels. Holding other variables constant, for every percent increase in the 2-year foreclosure sales variable, the count of HCV residencies is expected to increase by over 14 percent, when the tract poverty rate is only 5 percent. However, the effect of foreclosure sales on HCV count steadily increases as the tract poverty rate increases. Thus, foreclosures in neighborhoods with higher poverty rates exhibit a larger positive impact on HCV counts compared to neighborhoods with lower poverty rates.

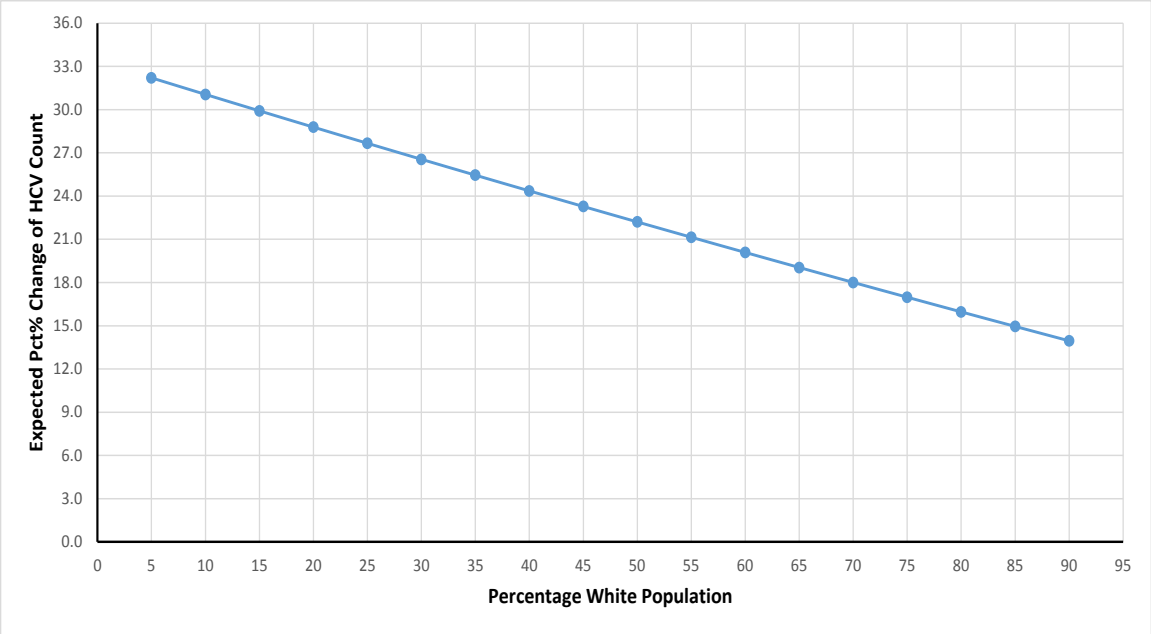

Figure 23. Effect of FC Sales on HCV Count by White Pop. Levels in Cuya County

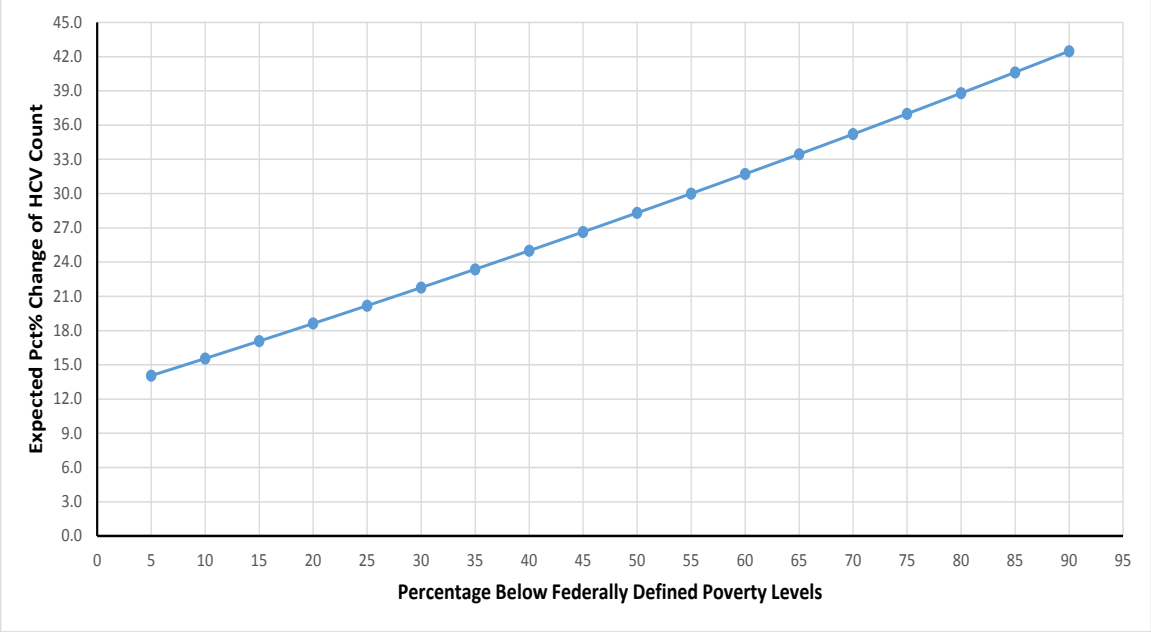

Figure 24. Effect of FC Sales on HCV Count by Poverty Levels in Cuya County

With regard to the additional non-interacted covariates in each interaction model, all variables exhibit the same coefficient operator sign and significance levels. Also, though not directly comparable, the two models exhibit similarities in the coefficient effect direction and significance levels with the previously estimated un-pooled un-logged no-interaction model for Cuyahoga County. As seen in Table 54, only two covariates switched from being statistically insignificant in the previous model to becoming a statistically significant predictor in the two interaction models.

Table 54. Comparison of NBReg Models' Coefficients for Cuyahoga County

	NO Pool / NO Log / NO Interaction		2YR LogFCS / INT-pctwhite		2YR LogFCS / INT-poverty	
	Sign of Coeff[a]	P-Value	Sign of Coeff	P-Value	Sign of Coeff	P-Value
Primary Predictor Variables						
(Intercept)	minus	SIG**	plus	INSIG	plus	INSIG
fcsales (1YR)	plus	SIG***				
lag of fcsales (1YR)	plus	SIG***				
log of fcsales (2YR pool)			plus	SIG***	plus	SIG***
INT(fcsales2yr*pctwhite)			minus	SIG***		
INT(fcsales2yr*poverty)					plus	SIG***
Additional Control Variables						
total population	plus	SIG***	plus	SIG***	plus	SIG***
percent Black	plus	SIG***				
percent White			minus	SIG***	minus	SIG***
percent Asian	minus	SIG***	minus	SIG***	minus	SIG***
percent Latino	plus	SIG***	plus	SIG***	plus	SIG***
percent public assistance	plus	INSIG	minus	INSIG	minus	INSIG
median HH income	minus	SIG***	minus	SIG***	minus	SIG***
percent female-headed HH	plus	INSIG	plus	SIG**	plus	SIG**
pct unemployment	minus	SIG***	minus	SIG***	minus	SIG***
pct renters moved in past yr	plus	INSIG	plus	INSIG	plus	INSIG
pct renter-occupied units	plus	SIG***	plus	SIG***	plus	SIG***
percent foreign-born	plus	INSIG	plus	SIG*	plus	SIG*
pct rental units under FMR	plus	INSIG	plus	INSIG	plus	INSIG
rental vacancy rate	plus	SIG***	plus	SIG***	plus	SIG***
percent poverty	minus	SIG*	minus	SIG**	minus	SIG***
median age of housing unit	plus	SIG***	plus	SIG***	plus	SIG***
pct detached 1-unit rent homes	minus	INSIG	plus	INSIG	plus	INSIG
central city dummy	minus	SIG***	minus	SIG***	minus	SIG***

Notes

a. Coefficients for each model are unstandardized coefficients.

* p < 0.1; ** p < 0.05; *** p < 0.01

5.4.3. Mecklenburg County Interaction Model Results

For Mecklenburg County, two models were estimated with the percentage White variable and median household income variable interacting with the 2-year foreclosure variable in each model. As observed in Model 5, the interaction term between the 2-year foreclosure and percent White variables was found to be statistically significant with a p-value of < 0.01 (see Table 55). Once again, the operator of the unstandardized coefficient was found to be negative, as expected. This suggests that foreclosures in areas with more White population have less of a positive impact on HCV residency counts.

As observed in Model 6, the interaction term between the 2-year foreclosure and median household income variables was found to be a statistically significant predictor of HCV counts ($p < 0.01$), while the sign of the coefficient was negative, as expected. This result suggests that foreclosures in higher-income tracts have less of a positive impact on HCV residency counts.

Unlike the other study counties' model results, the main effects of percentage White in Model 5 and median household income in Model 6 were both found to be statistically insignificant. However, this is not considered an issue in that the coefficient of the main effect variables are the effect that the variable has on HCV counts when the 2-year foreclosure variable is zero. Since, the foreclosure variable does not take on the value of zero in the Mecklenburg County sample,[23] effectively the coefficient of the main effects have no particular meaning in these model outputs.

[23] In the Mecklenburg sample, there were 17 observations (2% of total) with zero (0) values for the raw 2-year foreclosure count variable. Since the log of zero is undefined, I added a small number (i.e., 0.00001) to the entire sample of the 2-year foreclosure variable when transforming to logs.

Table 55. NBReg Interaction Model Results for Mecklenburg County, NC

	Interaction Model 5 (FCS * pctwhite)				Interaction Model 6 (FCS * income)			
VARIABLES	COEFF[a]	Robust SE[b]	P-Value	IRR	COEFF[a]	Robust SE[b]	P-Value	IRR
(Intercept)	0.37768	1.32641	0.776	—	1.33197	1.30148	0.306	—
log of fcsales (2YR pool)	0.54678***	0.06930	0.000	1.728	0.33027***	0.06859	0.000	1.391
INT(fcsales2yr*pctwhite)	-0.00541***	0.00104	0.000	0.995	—	—	—	—
INT(fcsales2yr*income)	—	—	—	—	0.00000***	0.00000	0.001	1.000
total population	0.00006**	0.00003	0.012	1.000	0.00008***	0.00003	0.002	1.000
percent White	-0.00222	0.01014	0.827	0.998	-0.02152***	0.00661	0.001	0.979
percent Asian	-0.02685	0.02430	0.269	0.974	-0.02894	0.02394	0.227	0.971
percent Latino	0.01210	0.01660	0.466	1.012	0.01034	0.01680	0.538	1.010
percent public assistance	-0.10579**	0.04411	0.016	0.900	-0.09753**	0.04649	0.036	0.907
median HH income	-0.00002**	0.00001	0.045	1.000	-0.00001	0.00001	0.150	1.000
percent female-headed HH	0.02612***	0.00805	0.001	1.026	0.02618***	0.00817	0.001	1.027
pct unemployment	-0.04692**	0.02002	0.019	0.954	-0.05408***	0.01958	0.006	0.947
pct renters moved in past yr	0.00966	0.00670	0.149	1.010	0.01113*	0.00668	0.096	1.011
pct renter-occupied units	0.03589***	0.00758	0.000	1.037	0.03406***	0.00792	0.000	1.035
percent foreign-born	-0.01422	0.02233	0.524	0.986	-0.01268	0.02271	0.577	0.987
pct rental units under FMR	0.01512**	0.00733	0.039	1.015	0.01342*	0.00736	0.068	1.014
rental vacancy rate	0.00367	0.01269	0.773	1.004	0.00765	0.01267	0.546	1.008
percent poverty	-0.01379	0.01383	0.319	0.986	-0.01643	0.01346	0.222	0.984
median age of housing unit	-0.01126*	0.00678	0.097	0.989	-0.00873	0.00678	0.198	0.991
pct detached 1-unit rent homes	0.01950***	0.00444	0.000	1.020	0.02014***	0.00452	0.000	1.020
City of Charlotte, NC	0.05321	0.45490	0.907	1.055	0.08835	0.46732	0.850	1.092
Year 2007 dummy	-0.06026	0.04142	0.146	0.942	-0.05456	0.04207	0.195	0.947
Year 2008 dummy	-0.02438	0.04795	0.611	0.976	-0.03241	0.04728	0.493	0.968
Year 2009 dummy	-0.15753***	0.06015	0.009	0.854	-0.14683**	0.06599	0.026	0.863
Year 2010 dummy	-0.18474**	0.09064	0.042	0.831	-0.13352	0.10348	0.197	0.875
Year 2011 dummy	-0.37955***	0.07793	0.000	0.684	-0.34465***	0.08937	0.000	0.708
(Negative binomial)[c]	0.64263***	0.09608	—	—	0.65211***	0.09661	—	—
Wald ratio χ^2	587.89***				574.43***			

Notes

a. Unstandardized coefficients

b. SE for foreclosure related variables are not clustered, while all other control variables are clustered at the census tract level.

N = 858 observations

c. This measures the significance of over-dispersion, where an estimate greater than zero suggests over-dispersion.

* p < 0.1; ** p < 0.05; *** p < 0.01

The interaction terms' effects on the count of HCV residencies is more clearly shown in the following figures. Figure 25 shows the effect of foreclosures on HCV counts at various levels of percentage White population. Holding other variables constant, for every percent increase in the 2-year foreclosure sales variable, the count of HCV residencies is expected to increase by over 68 percent, when Whites comprise only 5 percent of the population. However, the effect of foreclosure sales on HCV count steadily decreases as the percentage of White population in a tract increases, though the effect is still shown to be positive. As such, foreclosures in areas with more White population have less of a positive impact on HCV counts.

Figure 26 shows the effect of foreclosures on HCV counts at various levels of median household income. Holding other variables constant, for every percent increase in the 2-year foreclosure sales variable, the count of HCV residencies is expected to increase by approximately 35.6 percent, when the tract median household income is $10,000 USD. However, the effect of foreclosure sales on HCV count decreases as the tract median household income increases, where the effect overturns from a positive effect to a negative effect in neighborhoods with extremely high median household incomes. Thus, foreclosures in higher median household income tracts have less of an impact on HCV residency counts and incidentally are shown to have a negative impact on HCV residency counts in extremely high median household income tracts.

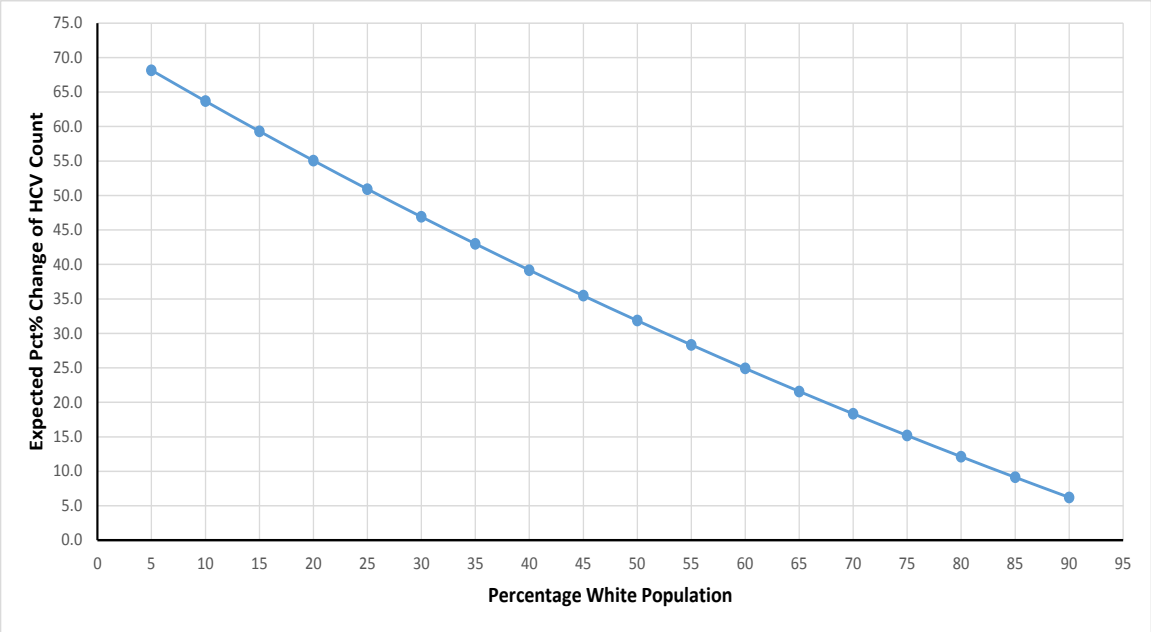

Figure 25. Effect of FC Sales on HCV Count by White Pop. Levels in Meck County

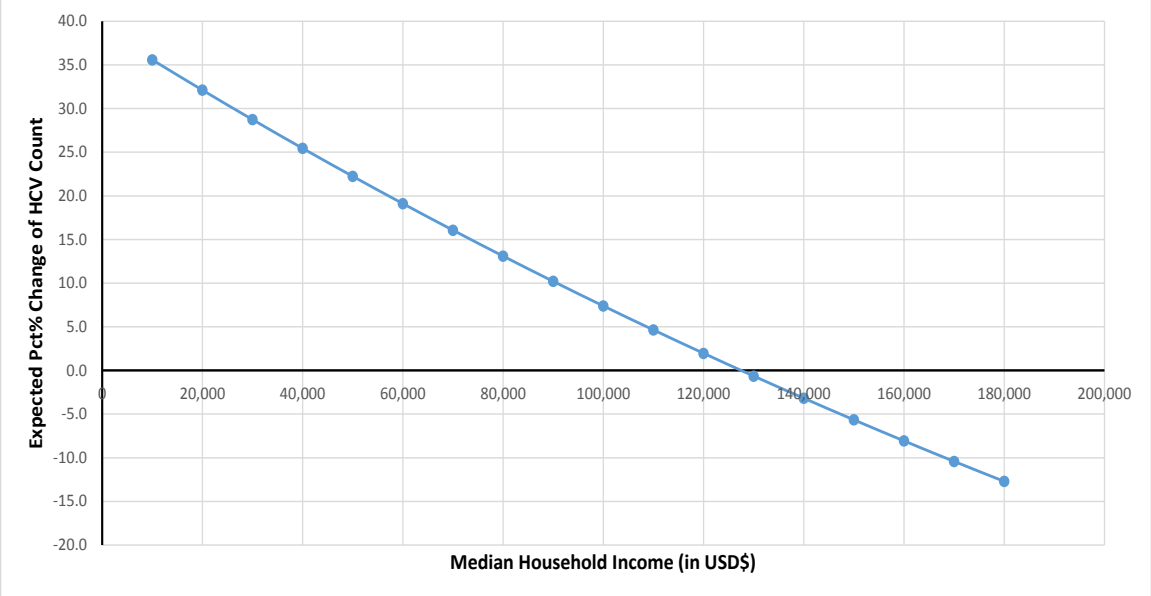

Figure 26. Effect of FC Sales on HCV Count by Income Levels in Meck County

With regard to the additional non-interacted covariates in each interaction model, almost all variables exhibit the same coefficient operator sign and significance levels (see Table 56). Also, though not directly comparable, the two models exhibit similarities in the coefficient effect direction and significance levels with the previously estimated un-pooled un-logged no-interaction model for Mecklenburg County.

Table 56. Comparison of NBReg Models' Coefficients for Mecklenburg County

	NO Pool / NO Log / NO Interaction		2YR LogFCS / INT-pctwhite		2YR LogFCS / INT-income	
Primary Predictor Variables	Sign of Coeff[a]	P-Value	Sign of Coeff	P-Value	Sign of Coeff	P-Value
(Intercept)	plus	INSIG	plus	INSIG	plus	INSIG
fcsales (1YR)	plus	SIG***				
lag of fcsales (1YR)	plus	SIG***				
log of fcsales (2YR pool)			plus	SIG***	plus	SIG***
INT(fcsales2yr*pctwhite)			minus	SIG***		
INT(fcsales2yr*income)					minus	SIG***
Additional Control Variables						
total population	plus	SIG*	plus	SIG**	plus	SIG***
percent Black	plus	SIG***				
percent White			minus	INSIG	minus	SIG***
percent Asian	minus	INSIG	minus	INSIG	minus	INSIG
percent Latino	plus	INSIG	plus	INSIG	plus	INSIG
percent public assistance	minus	SIG*	minus	SIG**	minus	SIG**
median HH income	minus	SIG**	minus	SIG**	minus	INSIG
percent female-headed HH	plus	SIG***	plus	SIG***	plus	SIG***
pct unemployment	minus	SIG***	minus	SIG**	minus	SIG***
pct renters moved in past yr	plus	SIG*	plus	INSIG	plus	SIG*
pct renter-occupied units	plus	SIG***	plus	SIG***	plus	SIG***
percent foreign-born	minus	INSIG	minus	INSIG	minus	INSIG
pct rental units under FMR	plus	SIG*	plus	SIG**	plus	SIG*
rental vacancy rate	plus	INSIG	plus	INSIG	plus	INSIG
percent poverty	minus	INSIG	minus	INSIG	minus	INSIG
median age of housing unit	minus	INSIG	minus	SIG*	minus	INSIG
pct detached 1-unit rent homes	plus	SIG***	plus	SIG***	plus	SIG***
central city dummy	minus	INSIG	plus	INSIG	plus	INSIG

Notes

a. Coefficients for each model are unstandardized coefficients. * p < 0.1; ** p < 0.05; *** p < 0.01

5.4.4. Summary of Three-County Interaction Model Results

The negative binomial regression models with each one interaction term all show the expected coefficient operator signs. The interaction effect is negative for the foreclosure variable by percent White and equally negative for the foreclosure variable by median household income, in all three counties' model estimations (see Table 57). The interaction effect is positive for the foreclosure variable by percent poverty in Cuyahoga County, as expected. Though not directly tested for by introducing both the racial and SES variable interaction terms into one model due to loss of statistical power, given the empirical literature on what constitutes a more affluent (or any level-type of) neighborhood, it should be possible to interpret the two models from each county in tandem, although with caution.

Table 57. Comparison of Hypothesis 4 Model Testing Results

Hypothesis 4: Foreclosures in high socio-economic status (SES) and low-minority neighborhoods result in fewer HCV units than foreclosures in lower SES and high-minority neighborhoods.				
NBReg Regression Model Output - Comparison of Interaction Terms				
Variable	**Sign of Coefficient[a]**			**Sign of Coefficient Implies**
	Cook Cty	**Cuya Cty**	**Meck Cty**	
INT (FCS * pctwhite)	—	—	—	**FCS in more White tracts have less positive impact on HCV**
INT (FCS * income)	—	— #	—	**FCS in higher income tracts have less positive impact on HCV**
INT (FCS * poverty)	N/A	+	N/A	**FCS in lower poverty tracts have less positive impact on HCV**

Notes

a. Coefficients for all three counties are unstandardized coefficients. Except when noted with '#', all coefficients were found to be statistically significant ($p < 0.01$).

#. Statistically insignificant

In regard to Cook County and Mecklenburg County, model results suggest that foreclosures in census tracts with higher median household income and higher percentages of White population have less of a positive impact on HCV residency counts compared to tracts with lower median household income and lower percentages of White population. In fact, in tracts that have extremely high median household income levels (i.e., above $130,000 USD), foreclosures are shown to have a negative effect on HCV residency counts. In regard to Cuyahoga County, model results suggest that foreclosures in census tracts with lower poverty and higher percentages of White population have less of a positive impact on the count of HCV residencies compared to tracts with higher poverty and lower percentages of White population.

CHAPTER 6.

SUMMARY DISCUSSION AND POLICY IMPLICATIONS

6.1. Summary of Results

This dissertation has established a positive relationship between foreclosures and the incidence HCV counts through an analysis of three large central metropolitan counties, each of which contain a large central city. Analyses of the first two hypotheses provided important spatial context on the distribution of HCV residencies before and after the peak of the foreclosure crisis in each county, while multivariate analyses of the last two hypotheses were able to show that foreclosures indeed had a role in the distribution of HCV residencies, in which more foreclosures led to more HCV residencies in a neighborhood.

Testing of the first hypothesis shows that, on average, HCV households are increasingly gaining access to previously unoccupied neighborhoods across all three counties. In Cook County, the share of census tracts with HCV households increased by nearly 4 percentage points from 2007 to 2012 with a 90 percent tract share in 2012. In Cuyahoga County, the share increased by nearly 5 percentage points during the same time period with an 89 percent share in 2012. Mecklenburg County also experienced an increase in tract share to 80 percent in 2012.

Though HCV households are increasingly found in more tracts across all three counties, the distribution is quite uneven, where all three counties exhibit spatial concentrations and clusters of HCV households. Also, spatial distribution characteristics

differed by county. In Cook and Mecklenburg County, HCV cluster locations remained relatively static before and after the peak of the foreclosure crisis, while it was discovered that new HCV clusters, in addition to inner-city clusters, were forming in the inner-ring suburbs in Cuyahoga County. As such, these findings are consistent with previous national-level research that have shown the HCV program to be widely, but unevenly, dispersed with HCV households increasingly spreading more into the suburbs (Covington et al., 2011; McClure et al., 2015).

Analysis of the second hypothesis show that though HCV households have dispersed widely, this does not necessarily translate into these households living in lower-poverty neighborhoods. Results from all three counties exhibit an increasing share in the amount of HCV households residing in extreme poverty tracts (i.e., over 40 percent poverty), as well as other tracts with comparably elevated levels of poverty. In Cook County, while tracts with under 30 percent poverty rates decreased across the county, tracts with over 30 percent poverty rates showed steady increases throughout the study duration. In Cuyahoga County, over two-thirds of all HCV households resided in tracts with over 20 percent poverty rates with the share percentage gradually increasing from 2007 to 2012. Though the share of HCV households that lived in tracts with extreme poverty was comparably low in Mecklenburg County, that share had nonetheless steadily increased throughout the study duration.

Multivariate analysis of the third hypothesis shows that foreclosures had some impact on the spatial distribution of HCV households during the study period. A positive relationship between the two primary variables of interest was established, where more foreclosures resulted in more HCV households in a neighborhood. Though the

magnitude of the positive effect was not found to be substantially large, the effect was also not considered trivial, across all three counties. In Cook County, holding other variables constant, a one unit increase in current and prior year foreclosure sales was estimated to increase HCV residency counts by 0.9 and 0.7 percent, respectively. A one standard deviation increase in current and prior year foreclosure sales was expected to lead to an increase in HCV count by 22.4 percent.

In Cuyahoga County, a one unit increase in current and prior year foreclosure sales was estimated to increase HCV counts by 1.5 and 1.6 percent, respectively. A one standard deviation increase in current and prior year foreclosure sales in Cuyahoga County, was expected to lead to an increase in HCV count by 45.4 percent. In Mecklenburg County, the HCV residency count was estimated to increase by 0.4 percent for a one unit increase in either current or prior year foreclosure sales. Also, a one standard deviation increase in current and prior year foreclosure sales in Mecklenburg County, was expected to lead to an increase in HCV count by 34.8 percent, respectively.

Additionally, several socioeconomic and housing control variables were found to have consistent effects (all positive or all negative signs of coefficients) on HCV residency counts for all three county analysis results, as supported by previous HCV literature. In particular, for all three counties, percentage of population in poverty had a consistent negative effect on HCV residency counts, which implies that HCV households are increasingly finding their way into less-poor neighborhoods. However, this promising evidence is subdued by the result where median household income also has a consistent negative effect on HCV residencies. This result combined with the previous result implies that, though it may be the case that HCV households are dispersing into

less-poor moderate income neighborhoods, they are still unable to penetrate into affluent high-income neighborhoods.

Finally, regression model results for the final hypothesis show that foreclosures have had less positive impact on HCV residency counts in higher socio-economic status and low-minority neighborhoods compared to lower socio-economic status and high-minority neighborhoods. Though not directly tested for in this analysis, one possibility that these results could speak to may be the presence of several barriers that limit HCV households from moving into these better-quality neighborhoods. These barriers may include illegal exclusionary zoning practices to ward off low-income and HCV households (Malpezzi, 1996), landlords who refuse to accept HCVs (Popkins & Cunningham, 2000), landlords who discriminate based on race (Greater New Orleans Fair Housing Action Center, 2009), or shady rental practices by housing authorities that steer HCV households away from better-quality neighborhoods (Katz & Turner, 2001).

6.2. Research Limitations and Ideas for Future Research

Returning to Figure 1 in Chapter 2, it was theorized that there were two ways in which foreclosures could result in creating a new supply of rental housing units, of which some percentage may accept HCV households. One supply-side argument was that new investors of foreclosed properties would buy to rent and sell later given the depressed housing market (Immergluck & Law, 2014), where some may be attracted to households with housing vouchers which would supply them with a stable rent flow (DiPasquale, 2011). It has also been speculated that some of these investors are drivers of a new

institutional asset class of single-family rental homes in moderate-income neighborhoods (Rahmani et al., 2012), of which some percentage may be affordable to HCV households.

The other supply-side argument was that more foreclosures in an area would trigger a "contagion effect," which may induce owner-occupants of other surrounding properties to foreclose and flee or convert-to-rental and flee as the neighborhood deteriorates and home prices decline (Frame, 2010; Towe & Lawley, 2013). As a result of these negative spillover effects, the new owners of such properties may be inclined to rent to HCV households and low-income households in general.

Given these supply-side arguments, though the results of this dissertation have established that foreclosures had a positive effect on the count of HCV residencies in a neighborhood, it is unable to clearly identify which particular mechanism (or mechanisms) assisted in producing these results. Evidence gained from the second and fourth hypotheses suggest that it may be the foreclosure "contagion effect" that is producing the rental housing supply, as an increasing share of HCV households are re-concentrating in high poverty neighborhoods, where coincidentally the impact of foreclosures on HCV residency counts is higher compared to lower-poverty higher-income neighborhoods. However, without pin-point data to match individual HCV households to individual back-on-the-market properties that were previously foreclosed upon, it is difficult to make such assumptions with any certainty.

Another research limitation is that this dissertation is unable to distinguish between HCV residencies who remained in place and those that moved (including those who were required to relocate due to rental foreclosures). As such, though this dissertation has shown evidence that foreclosures have a greater impact on HCV

residencies in neighborhoods with low socio-economic status (SES) and high minority concentration compared to high SES and low minority neighborhoods, it is unable to clearly assess whether those HCV households that moved (voluntarily or involuntarily) pertain to these results or exhibit different location patterns. If such evidence was available, it would further help to understand whether the new rental supply has the potential to further the goals of poverty deconcentration for HCV households.

One recent research appears to find evidence that foreclosures had a positive impact on the goals of poverty deconcentration for HCV households who experienced rental foreclosures in the city of Phoenix. Using parcel-level foreclosure and HCV data for the city of Phoenix, Pfeiffer and Lucio (2015) find that of the 8 percent of voucher holders who experienced rental foreclosures, most (85 percent) were able to relocate to neighborhoods with similar or lower levels of poverty compared to their previous residencies. However, the authors state that those HCV households who experienced rental foreclosures were, on average, residing in better-quality higher-income neighborhoods to begin with, where nearly 40 percent of these households resided in tracts with under 10 percent poverty rates (Pfeiffer & Lucio, 2015). Furthermore, they find that the change in neighborhood poverty rates for HCV households after a move is only in a range of 1 to 2 percent (Pfeiffer & Lucio, 2015). Therefore, since the authors lump all HCV households who experienced rental foreclosures into one group in their analysis, their results may be masking counteracting effects that may actually suggest an uneven change in the distribution of these households.

Finally, another limitation that hinders the discussion power of this dissertation is that though foreclosures were found to be a statistically significant predictor of HCV

residencies, the magnitude of the effect was found to be relatively modest, especially in comparison to the race and income variables. Though it could be the fact that the effect of foreclosures on HCV residencies is actually low, I believe that it is more of an issue of not having a finer grain of detailed parcel-level data for the two primary variables of interest. It has been verified in both empirical and case study HCV research that most HCV households who move after their first lease expires, usually make a relatively short-distance move (Feins & Patterson, 2005; Galvez, 2010). In fact, Pfeiffer and Lucio (2015) find that for moves of all HCV households (regardless of experiencing foreclosure or not) in the city of Phoenix, the average moving distance was 4 to 5 miles. Therefore, given that this dissertation uses the census tract as its unit of analysis, it is unable to fully detect the true magnitude of the effect of foreclosures on HCV residencies.

As such, the several limitations to this dissertation all suggest the need for a much finer grain of detailed parcel-level data for HCV residencies and foreclosures. As seen by the research of HCV households in Phoenix, such fine data opens up the possibility to produce much more detailed results and should provide a deeper understanding of the effects that are observed. Unfortunately, this dissertation was largely limited to census tract data for the two primary variables of interest. HCV data were retrieved from U.S. HUD's public database for subsidized housing, which is known for observable under-reporting of its data. This has been the case in this dissertation, where two counties exhibited odd values for particular study years.

U.S. HUD does have a database called the Multifamily Tenant Characteristics System/Tenant Rental Assistance Certification System, which provides parcel-level HCV household data. Due to household privacy concerns though, the database is

understandably private. However, gaining access to the database for research purposes is extremely difficult and tedious, and particularly more cumbersome to obtain for the junior scholar or student. Parcel-level foreclosure data are also increasingly becoming more difficult to obtain without spending absurd amounts of money or going through enormous amounts of administrative hassle and bartering. Given these constraints on data accessibility and the large amount of resources required to gain access, this dissertation was unable to obtain such finer grain parcel-level data.

6.3. Conclusion and Policy Implications

The Housing Choice Voucher program is the largest federally subsidized affordable housing program in the U.S., currently assisting over 2.1 million low-income households to find and obtain decent rental housing units in preferably higher-quality neighborhoods (U.S. HUD, 2014). Through the dispersal of low-income households, one of the program's goals is to deconcentrate poverty and alleviate the standard of living for program participants (U.S. HUD, 2010). Though the program has had some success in achieving this goal, there is continuing evidence that it has yet to realize its full potential, where the distribution of HCV households is quite uneven with several clusters of these households still situated in extreme poverty neighborhoods (McClure et al., 2015).

In light of the recent foreclosure crisis, the impediments of this goal of the HCV program, may have been further exacerbated as a large growing number of HCV tenants have experienced involuntary eviction due to rental property foreclosures. Due to these untimely evictions and limited resources and savings at their disposal, it would appear a

daunting task for HCV households to find a suitable relocation home in preferably a neighborhood of similar or better quality. Further adding to their difficulty in obtaining a quality home is that the volume of affordable housing is in continuous decline across the U.S. (JCHS, 2015). However, due to the massive amount of foreclosures and the depressed housing market for homeownership, there is evidence that a plethora of owner-occupied units are being converted into rental housing units in a diverse income range of neighborhoods (Ellen et al., 2013).

In this regard, this dissertation has endeavored to shed light on whether the new rental housing supply created from previously foreclosed properties, has assisted the HCV program's goal of poverty deconcentration by providing HCV households (evicted or not) with an additional option for residential relocations. The dissertation finds that foreclosures have indeed had a positive effect on HCV residencies in a neighborhood, though the impact was greater in lower-income higher-minority neighborhoods compared to higher-income lower-minority neighborhoods. Given these results, this dissertation cautiously argues that the positive effect of foreclosures on HCV residencies may be more observed from rental housing supply created in distressed low-income high-poverty neighborhoods. Though more research is required to fully understand the causes and magnitude of the effect of foreclosures on HCV residencies, the findings of this dissertation should give rise to the following policy recommendations.

Reducing Relocation Barriers – Protection for Renters Facing Foreclosure

First, there needs to be a uniform national policy to protect the rights of tenants (including HCV households) facing eviction due to rental property foreclosures. Up until recently, the "Protecting Tenants at Foreclosure Act (PTFA)" of 2009 provided federal protection for renters living in foreclosed properties. Some of the provisions of the law (most relevant to HCV households) included; giving renters notice of foreclosure, providing renters with at least a 90 days' notice before being required to move, and new owners must honor existing private and Section 8 voucher leases unless the tenant violates the terms of the lease or the owner wishes to personally live in the property. However, this law has permanently sunset as of December 31, 2014 and though new bills to restore and make permanent the provisions of this act have been introduced to both the U.S. House of Representatives and the U.S. Senate in 2015, neither have yet to pass the hearing stage nor do political analysts believe it will ever pass muster (GovTrack, 2015).

As such, renters facing foreclosure today can only rely on state and local policy provisions, where in many states the protection is much weaker than those that were provided by the PTFA (NLIHC, 2015). With regard to the study areas in this dissertation, Illinois is the only state that provides renter protection to the level of the now expired PTFA (NLIHC, 2015). In North Carolina a mere 10 days' notice is required before owners are able to evict tenants, while Ohio has no specific protection policy in place (NLIHC, 2015). These low-levels of tenant protection are worrisome, as the severe time constraint should compound the difficulties of low-income HCV households' efforts to find a suitable relocation home, more so in preferably a better-quality neighborhood.

Reducing Relocation Barriers – Institutionalized Relocation Assistance

This dissertation has found that foreclosures have a larger impact on HCV residencies in lower socio-economic and higher minority neighborhoods compared to higher socio-economic and lower minority neighborhoods. As was suggested earlier, such results may be due to insufficient relocation assistance and exclusionary and discriminatory practices. In particular, for those HCV households that are involuntarily displaced and under significant time duress, these issues may effectively reduce the relocation options available to a household. A household's difficulty in residential relocation is further exacerbated by the fact that affordable housing is in continuous decline across the nation. With regard to new rental housing, according to JCHS (2015), only about 30 percent of all new rental units constructed during the past decade and 10 percent of all newly constructed large multi-family rental units (i.e., 20 or more units) rent at or below U.S. HUDs' Fair Market Rent. Also, though the institutional asset class of single-family rentals has increased dramatically over the years since the peak of the foreclosure crisis, there is already evidence that asking rents are steadily increasing, thereby making it unaffordable for most low-income households (Edelman et al., 2014; Mills et al., 2015).

As such, there is a clear need for an official relocation assistance and counseling division in all local housing authorities to improve the efficiency of HCV household moves, and particularly for involuntary time-constrained moves. Though experimental programs such as Gautreaux and Moving-to-Opportunity have shown much success due to day-to-day relocation counseling (Rosenbaum & Zuberi, 2010), such assistance appears to be largely void in the actual HCV program.

Reducing Relocation Barriers – Source-of-Income Protection Policy

Past and present HCV research has shown that reducing exclusionary housing discrimination results in better success rates of HCV households to relocate into lower-poverty better-quality neighborhoods. In their national study of HCV success rates, Finkel & Buron (2001) show that the rate at which HCV households are able to successively relocate into lower-poverty neighborhoods is 12 percent higher in areas with effective SOI policies in place. A local study conducted by the Equal Rights Center in the District of Columbia shows that since the district enacted a SOI policy in 2006, landlord discrimination of HCV households fell from over 60 percent in 2005 to 28 percent in 2013 (Equal Rights Center, 2013). As such, the evidence shows that SOI policies should have a positive impact in reducing housing discrimination at both the national and local levels.

However, as of 2014, SOI protection laws only existed in 13 states and 30 local jurisdictions (Poverty & Race Research Action Council, 2014), where most of these jurisdictions lie in the northern, northeast and Pacific regions of the U.S. Notably, Miami-Dade County is the only southern U.S. jurisdiction with a SOI policy in place. More disturbingly, though the city of Austin in Texas passed a local SOI protection policy in March 2015, a mere two months later, the State of Texas legislature backed by the Austin Apartments Association effectively voided Austin's ordinance by enacting a bill that prohibits any local jurisdiction in Texas from enacting a SOI policy (Livesley-O'Neill, 2015). In short, Texas policymakers have *legalized housing discrimination*.

Given the vast difference in political climates across the country, the simple answer would be to recommend a federally-mandated SOI protection policy that trumps

all state or local laws. However, given the disheartening situation in Texas, the likelihood of such a policy to even pass muster appears rather slim. Another possibility would be to try and appease SOI opposing landlords, in order to reduce their opposition stance. A common complaint given by discriminating landlords around the country is that HCV households have a higher propensity to damage property and fall behind on their rent payments (Rosen, 2014). In this regard, local jurisdictions might consider to compensate landlords for these monetary losses by setting up a public indemnity fund. This could be seen as a defeatist strategy, especially since these same landlords would probably rent to HCV households if the rental vacancy rate were to increase and the demand for rental housing decreases. However, in the absence of a universal SOI policy, methods such as the one suggested above may be the only way to lessen the apprehension the opposition has for SOI policies.

Affordable Rental Housing Provision – Mom & Pop Investor Mortgage Financing + Small Area Fair Market Rent Adoption

Since quite a fair amount of HCV households reside in 1~4 unit rental housing and single-family homes usually operating by mom and pop landlords, it may be feasible for the U.S. government to extend credit to similar small-scale investors in obtaining housing in neighborhoods with lower-poverty levels. U.S. HUD could offer attractive Federal Housing Administration (FHA) loans to prospective investors as long as they agree to accept HCV households. The FHA loans are attractive in the sense that since borrowers pay for mortgage insurance, the loans usually offer attractive interest rates with less stringent and more flexible qualification requirements. Also, the minimum down payment is merely 3.5 percent of the home purchase price.

Though such a scheme may well work in the initial phases, I question the motives of whether private investors would maintain the conditional FHA loan for a lengthy period of time. Since the main intent of the private investor would be to maximize one's capital returns on investment, I would suspect quite an exodus of investors from this scheme once they have paid off a sufficient portion of the loan. Moreover, since the residential neighborhood would be of better-quality than low-income neighborhoods, the prospects of future home value appreciation should also be higher. This may lead to higher asking rent prices, which may become unaffordable for HCV households even with the housing subsidy.

In this regard, I propose an additional policy recommendation to work in tandem with the small-scale investor financing scheme in order to ensure that private investors stick to the program. As currently construed, HUD's FMR values are essentially a one-size-fits-all median rent value for large metropolitan areas, which already implies that it would be comparably more difficult for HCV households to be able to afford housing rent prices in higher-income neighborhoods than lower-income neighborhoods. In this regard, I advocate for a smaller area revision of the FMR, which may enable HCV households to afford increasing rent prices in higher-income neighborhoods. This revision may be politically unviable since it requires more funding for housing vouchers in general. However, unless HCV households are able to increase their rent paying competitiveness in the private market, I believe their prospects of moving into higher-income neighborhoods would be further constrained, especially given the historically low rental vacancy rates and high rental housing demand.

Increased Authorization of Housing Vouchers

Finally, there is an obvious need for an increase in the amount of HCV availability. Though there are many difficulties that an HCV household may face when trying to relocate to a new residence, the housing voucher subsidy does act as a security blanket which enables a household to possibly obtain higher-quality housing in a better-quality neighborhood that is unattainable without the voucher. Yet, the U.S. Congress and its policymakers appear determined to *reduce* HCV availability and not restore or increase it. In 2013, over 85,000 HCVs were lost due to sequestration cuts, reducing the overall figure to a little over 2.1 million low-income households assisted (Center on Budget and Policy Priorities, 2015). Moreover, in 2015, the 114th Congress approved to continue its sequestration cuts by reducing HCVs by about an additional 28,000 vouchers (Executive Office of the President, 2015). Given that a low-income household's chances of relocating to a less-poor better-quality neighborhood becomes extremely low without a housing voucher subsidy, it would be in the best interests of policymakers to not cut back on such federal funding, which encourages housing mobility, housing stability and economic recovery.

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